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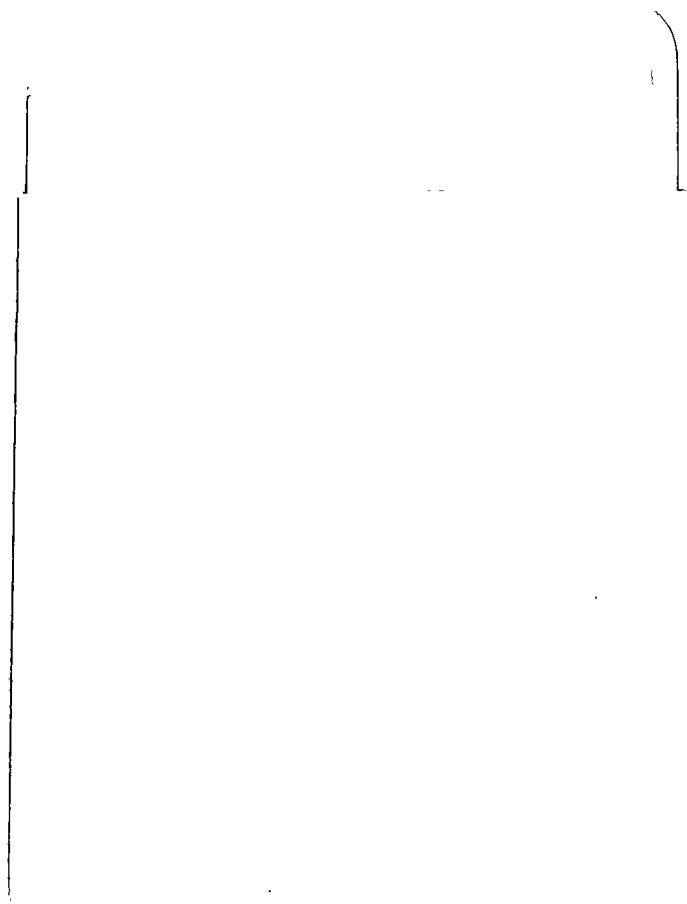
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DEPARTMENT OF THE ARMY FIELD MANUAL

ENGINEER TOPOGRAPHIC UNITS

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HEADQUARTERS, DEPARTMENT OF THE ARMY
OCTOBER 1968



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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 9 October 1968

ENGINEER TOPOGRAPHIC UNITS

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* This manual supersedes FM 5-146, 15 October 1963, including all changes.

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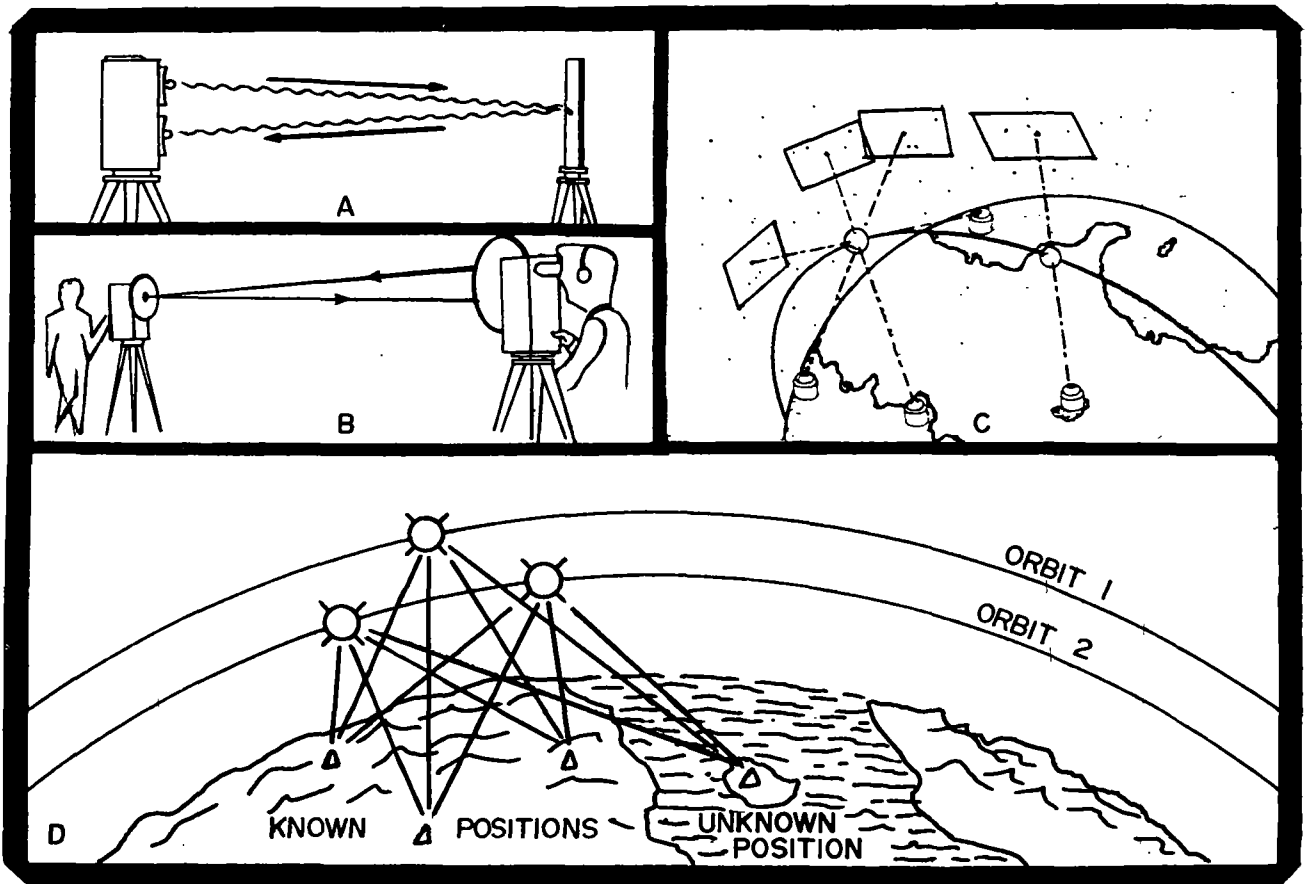
CHAPTER 1

INTRODUCTION

1-1. General

a. The employment of artificial and natural earth satellites in geodetic programs coupled with advances in instrumentation and collection systems has provided the means for rapidly and accurately measuring the earth's size and shape. These earth measurements will provide the basic network of ground control upon which engineer topographic units can prepare

maps, charts, and geodetic data and related engineer intelligence studies. Future automation of cartographic and reproduction phases of military mapping, together with the use of electronic distance ranging systems for ground survey measurements, will reduce the time required for engineer topographic units to produce mapping, charting and geodetic (MCG) products (fig. 1-1).



a. Ranging System (line-of-sight, light wave)
b. Ranging System (line-of-sight, radio wave)

c. Artificial satellite (triangulation with stellar cameras)
d. Artificial Satellite (electronic trilateration)

Figure 1-1. Geodetic precision tools.

b. Military forces without adequate knowledge of the terrain and area of operation are severely handicapped. Topographic maps, terrain intelligence, ground survey control and related materials provide this knowledge and are distributed through map depots operated by the engineer topographic units.

1-2. Purpose

a. The purpose of this manual is to provide doctrine and guidance on the mission, organization, training, capabilities and employment of engineer topographic troop units.

b. It is further designed to assist staffs of higher headquarters in the proper utilization, support and assignment of engineer topographic troop units responsible for preparation, reproduction, storage and distribution of engineer mapping, terrain intelligence, cartographic, and photographic products.

c. This manual is intended to assist the topographic unit commanders, their staffs and others directly concerned with the training of personnel, directing topographic operations, and supply and maintenance support functions in effectively meeting the command topographic program requirements.

1-3. Scope

a. This manual summarizes the mapping, charting, and geodetic (MCG) management function of the Department of Defense; outlines the broad management functions and responsibilities of Department of Army; defines the mission, organization structure, and capability of engineer topographic troop units and related teams. It describes the organization, communications and weapons of topographic troop units. Equipment is described in general functional terms. The appropriate supply catalog should be consulted to obtain detailed information on equipment. The citation of TOE includes only the basic numerical designation of the TOE concerned without any indication of the alphabetical suffix. The current version of cited TOE should be consulted when detailed information concerning organization or equipment is required.

b. It outlines the operations of engineer topographic

troop units and develops in detail how they are conducted.

c. It contains the principles employed in training personnel, both as individuals and as team members, stressing close cooperation and teamwork. It outlines the training objectives and describes the means and methods available to the engineer commander and his staff in conducting training programs, field exercises and training tests. Doctrine is stressed throughout this manual. The techniques required to perform topographic functions are not within the scope of this manual.

1-4. Applicability

The material in this manual is applicable to both limited and general war, either nuclear or nonnuclear, and to cold war or stability operations.

1-5. Use of This Manual

a. This manual is designed to be used in conjunction with other manuals and doctrinal publications, particularly those dealing with mapping, charting, geodesy and terrain intelligence. For detailed technical coverage see appropriate subject manual listed in Appendix A.

b. Users of this manual are encouraged to submit recommendations to improve its clarity or accuracy. Comments should be keyed to the specific page, paragraph, and line of the text to which they refer. Reasons should be provided for each comment to insure understanding and permit complete evaluation. Comments should be forwarded directly to the Commanding Officer, U.S. Army Combat Developments Command Engineer Agency, Fort Belvoir, Virginia 22060. Originators of proposed changes which would constitute a significant modification of approved Army doctrine may send an information copy, through command channels, to the Commanding General, U.S. Army Combat Developments Command, Fort Belvoir, Virginia, 22060, to facilitate review and follow-up.

c. The management functions and responsibilities of Department of the Army relating to mapping, charting, and geodetic (MCG) activities are undergoing change. A Topographic Command has been established at the Department of the Army level to manage MCG activi-

ties. A change to this manual will be published after the organizational concepts of the Topographic Command have been implemented.

1-6. Topographic Support

The phrase "topographic support" as used in this manual, encompasses services and products provided by topographic troop units. It includes but is not limited to the following:

a. Services

- (1) Provide direct mapping support to the appropriate commands to which assigned.
- (2) Furnish ground control for artillery and missile fire.
- (3) Perform evaluation of aerial photography.
- (4) Assist in the accomplishment of the Department of the Army and theater mapping

program in coordination with the chief of Engineers.

b. Products

- (1) Aerial photographs (limited reproduction)
- (2) Topographic maps
- (3) Photomaps
- (4) City plans
- (5) Charts
- (6) Special maps and map substitutes
- (7) Terrain studies
- (8) Map indexes
- (9) Trigonometric lists
- (10) Gazetteers
- (11) Technical instructions
- (12) Catalogs
- (13) Other military geographic information and documentation.



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CHAPTER 2

TOPOGRAPHIC RESPONSIBILITIES AND PROGRAMS

2-1. General

a. The Joint Chiefs of Staff (JCS) establishes overall requirements and priority guidance for Department of Defense (DOD) mapping, charting, and geodetic activities (MCG) in support of Joint Strategic Operation Plans (JSOP).

b. The Director, Defense Intelligence Agency (DIA) exercises management control over DOD, MCG activities in accordance with the overall requirements and priority guidance established by JCS.

c. The Department of the Air Force performs air charting, aerial photography and airborne electronic control for all three Services. The Aeronautical Chart and Information Center (ACIC) is the primary chart production agency for the Department of Air Force.

d. The Department of the Navy performs hydrographic charting for all three Services. It may accomplish aerial photographic missions. The Naval Oceanographic Office (NAVOCEANO) is the primary chart production agency for the Department of the Navy.

e. The Department of the Army (DA) has specific functions and responsibilities for the DOD MCG activities. Within the DA, the Assistant Chief of Staff for Intelligence (ACSI) is the mapping and geodesy program director, while the Chief of Research and Development has responsibility for DA activities in these areas (fig. 2-1).

f. The Chief of Engineers, under the program direction of the Assistant Chief of Staff for Intelligence, has the responsibility for—

(1) Providing direct support to the ACSI in the execution of functions pertaining to the army mapping and geodetic activities.

(2) Providing technical supervision and coordination of worldwide army mapping, ge-

odesy, and military geographic information documentation (MGID) activities.

(3) Providing and directing assigned elements engaged in mapping, geodesy, military geographic information, and related services, to include maintenance of DOD World Geodetic System. The Army Map Service (AMS) is the primary map production and distribution agency for the Department of the Army (fig. 2-2). For a list of the specific responsibilities, see AR 10-5, AR 117-5 and TM 5-231.

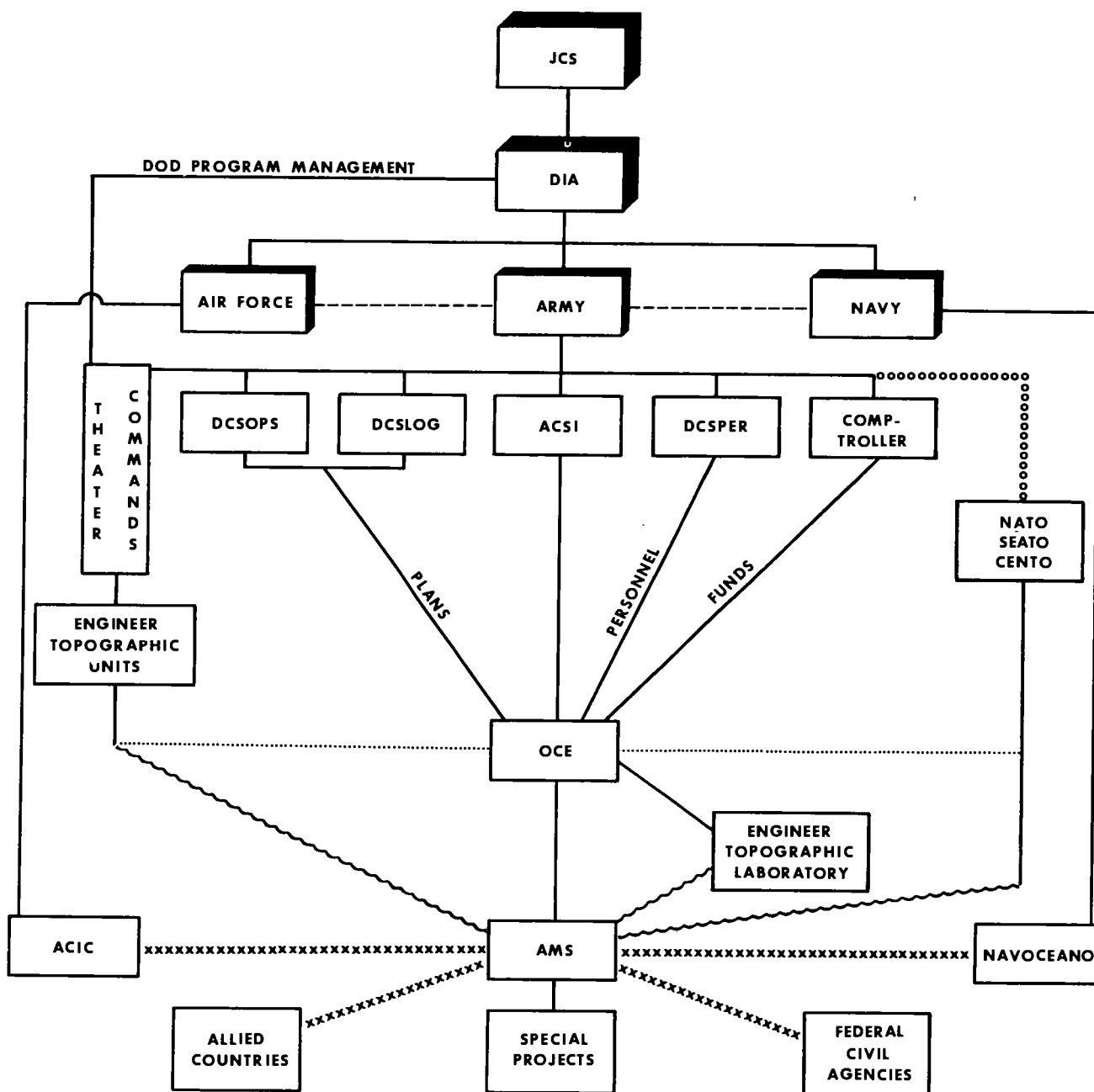
g. The Army Map Service (AMS) is a Corps of Engineer activity, operating under the command of the Chief of Engineers, for the production, storage, and distribution of maps, geodetic data, and related materials; and the operation of a central library of maps, geodetic and astronomic data, and related publications for common use of the Department of Defense. Army Map Service is the principal army agency capable of producing terrain models of adequate quality and quantity.

2-2. Theater Responsibilities

a. Command and Staff.

(1) The theater commander may be the commander of a joint, unified or specified command or the commander of a joint task force. The theater army component commander is responsible to the theater commander for providing topographic support for the area of operations in consonance with Army or unified or specified command plans.

(2) The theater army G2, is responsible to the theater army commander for mapping and geodetic plans, policies, and product requirements. He provides general staff direction and coordination of mapping and geodetic activities, including acquisition, production, reproduction, storage and distribution of maps and



LEGEND

- STAFF COORDINATION
- oooo POLICY COORDINATION
- OPERATIONAL MATTERS
- ~~~~ TECHNICAL MATTERS
- xxxx EXCHANGE OF MATERIAL
- COMMAND & CONTROL

Figure 2-1. Command and coordination channels for mapping, charting and geodesy.

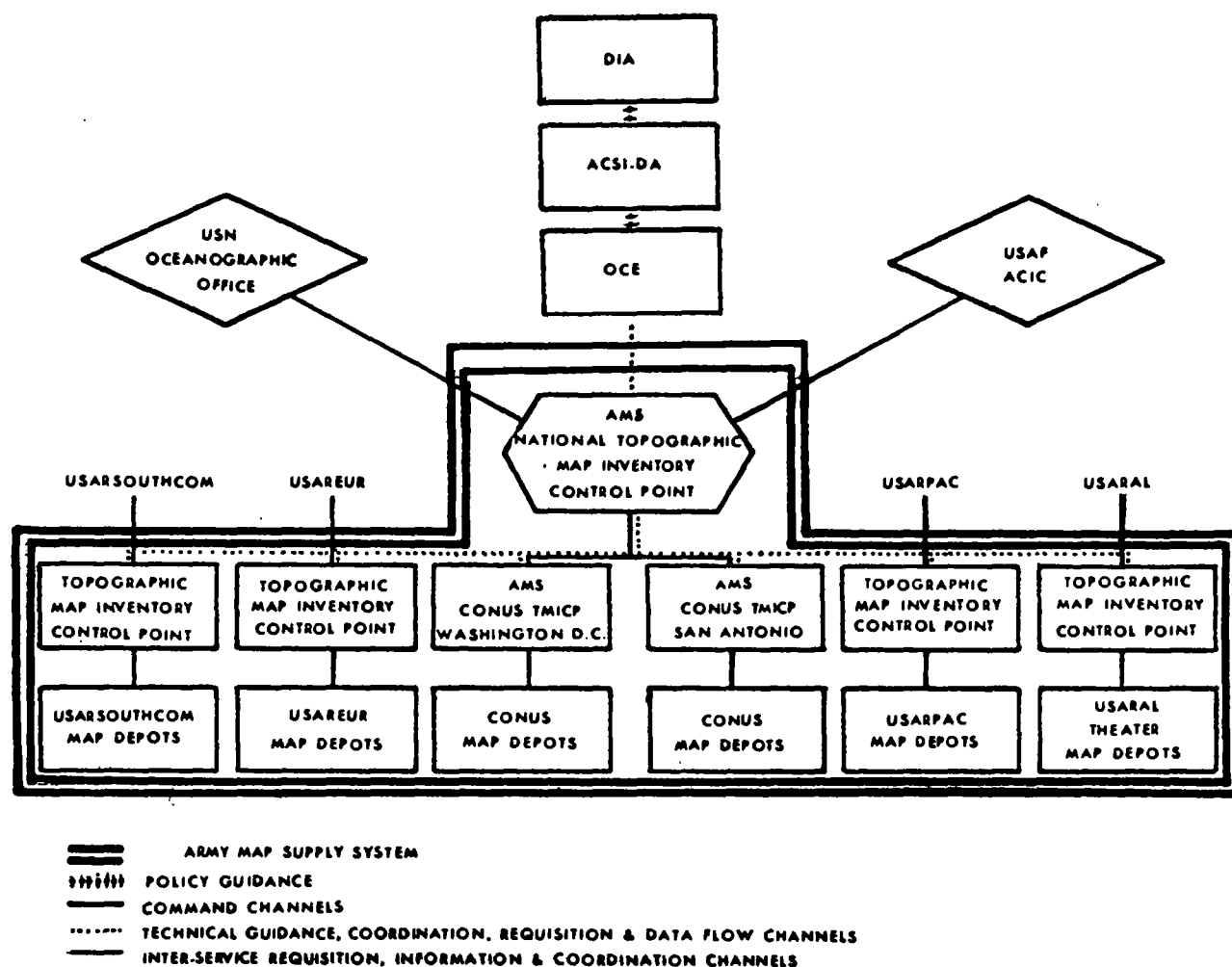


Figure 2-2. Map inventory control by automatic data process system.

related products and recommendations for the assignment of topographic troops.

(3) The theater army engineer, in coordination with the G2, establishes mapping and geodetic programs. He furnishes technical advice on all matters pertaining to the procurement, production, storage and distribution of maps and related materials. He is responsible for technical matters related to mapping personnel and equipment and for maintaining proficiency of topographic units. The theater army engineer accomplishes the mapping program by assigning specific missions to the topographic units under his control, coordinating their activities, maintaining close liaison with mapping

agencies of allied armies, and by requesting support from Army Map Service.

(4) Based on policies and requirements established by the J2/G2 of the theater command and the G2/Engineer of the theater army command, the assistant chief of staff, security plans and operations (ACofS, Scty Pls and Ops) of Theater Army Support Command (TASCOM) further develops these plans reflecting MCG theater requirements. The assistant chief of staff, services and engineering (ACofS, Svc and Engr) of TASCOM, provides staff direction and coordination for implementation of the theater MCG program.

(5) The Engineer Command (ENCOM),

in accordance with programs and policies provided by the theater army through TASCOT, is responsible for implementation of the theater mapping program.

b. Topographic Units.

(1) In the communication zone, implementation of the MCG program is accomplished by the engineer command (ENCOM) of the TASCOT, through its subordinate engineer base topographic battalion. Program directives from ACofS, Svc and Engr, TASCOT, are processed by the assistant chief of staff, intelligence of the ENCOM and are forwarded to the engineer base topographic battalion for action.

(2) Similarly, in the combat zone, implementation of the MCG program is accomplished by the engineer combat brigade of the field army. In the field army service area, program directives from the G2, field army, are processed by the field army engineer combat brigade and forwarded to the engineer topographic battalion, army, for action. In the corps areas, MCG program directives from the corps, G2, are processed by the corps engineer combat brigades and forwarded to the corps topographic companies for action.

(3) The topographic unit commander directs the operational phase of the MCG program in accordance with procedures contained in technical manuals and instructions received from the theater army engineer.

2-3. Program Coordination

In accordance with programs and policies provided by higher headquarters, the engineer topographic units are responsible for production, storage, issue and inventory control of maps and related data for their areas of interest. Notwithstanding the responsibilities outlined in paragraph 2-2, topographic engineers with corps, army and base topographic units and intelligence and engineer staffs at all echelons within the theater, coordinate with each other and AMS in the accomplishment of their mutually supported MCG program.

2-4. Map Supply

a. In order for the theater engineer to support military operations, he must be given the map requirement together with the relative

priority of the operation as early as practicable. Normally, time will allow only revision and reproduction of available maps. New compilation of limited critical areas may be accomplished depending upon the priorities established. The long range mapping program is designed to provide maximum usable map coverage of all probable areas of operation, with provision for improvement of coverage when required by specific military plans.

b. The Engineer, in coordination with the G2 at every echelon of command, has the responsibility for the distribution of maps and related materials within that command. (Maps and related materials are unique supply items not included in the X classes of supply.) The Office of the Chief of Engineers (OCE) has the responsibility at DA level. OCE has given Army Map Service (AMS) the responsibility of operating the National Topographic Map Inventory Control Point (NTMICP). The NTMICP has worldwide cognizance of map supply. It also produces the Map Supply Catalogs of standard stock items (fig. 2-3).

c. Theaters establish their own Topographic Map Inventory Control Points (TMICP). Topographic Map Inventory Control Points are responsible for the management and control of theater map supply and distribution. They also are the contact point with the NTMICP in providing data and coordinating map supply policies, programs, and procedures.

d. Map supply is carried out under the direction of the NTMICP and various theater TMICP. The supply procedures established by the ICP are in accordance with AR 725-50 (MILSTRIP). Maps are distributed to units through map depots which are generally operated by topographic units. These depots operate at a level comparable with the Direct Support Units of the general supply system. The Supply and Transportation Battalion of a Division Support Command is responsible for map supply within a division. Quantities required may be estimated based on tables provided in FM 101-10-1.

e. The theater engineer will obtain, direct from Army Map Service, all available material pertinent to mapping in the theater. The U.S. Army Map Supply System Catalogs available

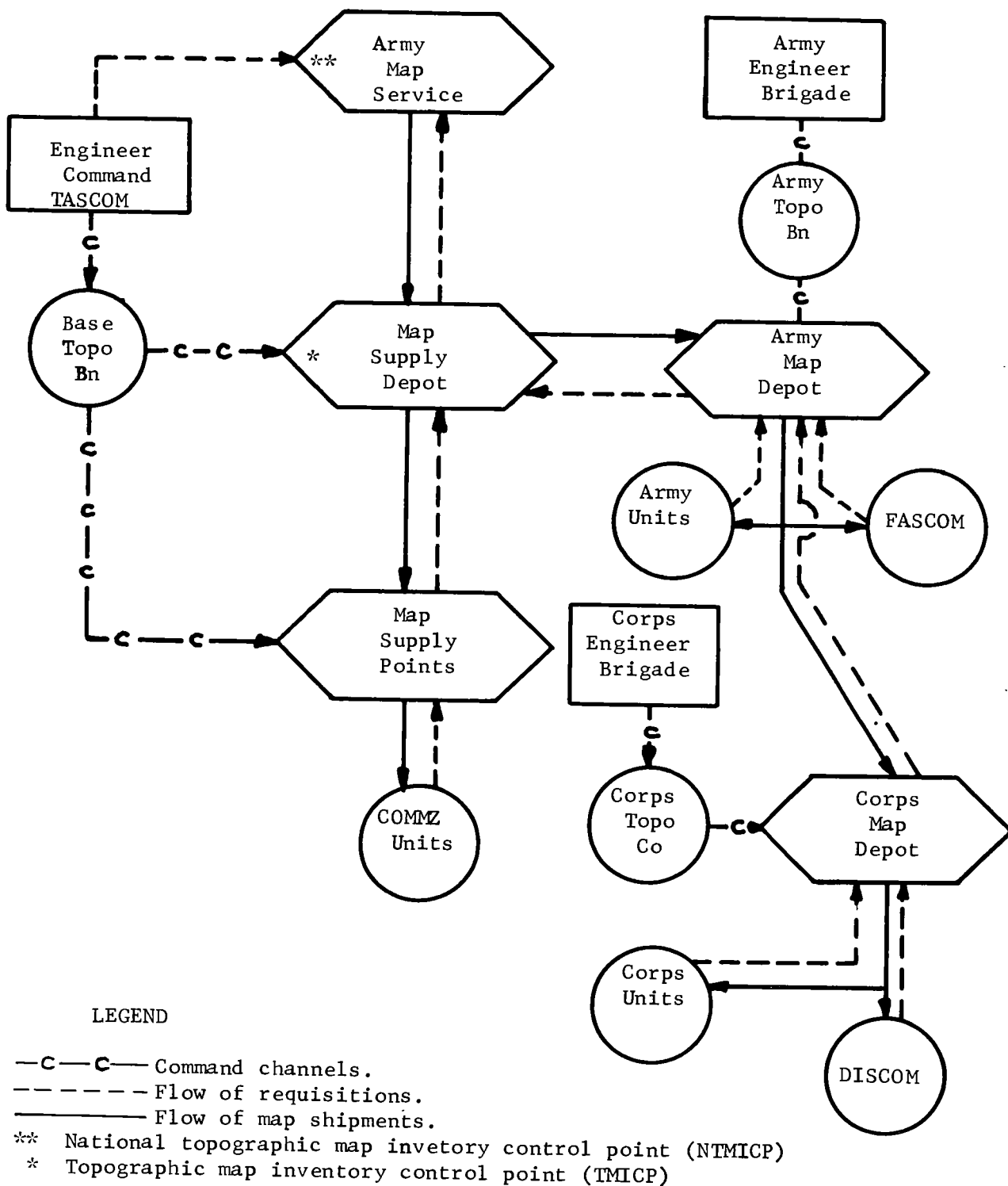


Figure 2-3. Flow chart, topographic products.

from the NTMICP indicate all active map series for which reproduction materials and map stocks are available. Additional information concerning inactive series and other nonstandard items may be obtained on request. Similar indexes and information should be obtained from allied and local sources. The engineer should take an active interest in procuring new source materials. Copies of all such material should be forwarded to Army Map Service.

2-5. Mapping Programs

The activities scheduled in mapping programs vary during periods of war or peace, and are dictated by the immediate or anticipated requirements of the military forces.

a. During peacetime, the Department of Defense promotes mapping, charting, and photographic activities in foreign areas by negotiating reciprocal agreements with friendly foreign governments. Various parts of South and Central America are being mapped by a cooperative program. United States territories, such as Puerto Rico, have been or are being mapped by various departments of the U.S. Government. Such activities exemplify the perspective of longrange planning. Elements of engineer topographic units may participate in these activities.

b. During the course of military liberations, military occupations, or periods of combat inactivity, theater commanders and their staffs should review the mapping, charting, and photographic situation. Aggressive and appropriate action during these periods can accomplish much to improve the required map coverage. Whatever activity is initiated during such periods is undertaken as an interim project and may embrace either original mapping or revision mapping.

c. Wartime mapping, charting, and photography consist of filling the most critical needs in sequence of established priority. Although such activities are comprehensive in scope in regard to the theater of operations area, they represent a relatively small contribution to the long-range program of worldwide, original mapping.

2-6. Program Development

The mapping program in a theater of operations is developed by the appropriate staff after consideration of the following:

- a.* Mapping requirements for all units of the command, including product types, scales, and quantities of maps, aerial cartographic photography required, and requirements of ground control.
- b.* Existing map quality and coverage.
- c.* Maps and mapping support available from the zone of interior, including mapping programs concurrently being undertaken by other services, agencies, and allied forces.
- d.* Number, type, phasing and capability of assigned topographic troop units.
- e.* Local contract facilities.
- f.* Need for special or auxiliary equipment.
- g.* Need and phasing of topographic supplies.

2-7. Automatic Data Processing Systems (ADPS) for Support of Topographic Operations

a. General. Topographic support in and to the theaters of operation makes use of ADPS in two major functions as follows:

(1) Survey computations necessary to provide geodetic control and cartographic data. These computations are performed on the Field Artillery Digital Automatic Computer (FADAC) organic to the engineer base survey company.

(2) Army Map Service is designated the NTMICP and coordinates map supply transactions with theaters of operations map inventory control points (fig. 2-2).

2-8. ADP Application to U.S. Army Map Supply

Theater map supply procedures are computerized to the maximum extent possible in order to decrease supply response time, satisfy data requirements of the NTMICP, and provide operational data and statistics for efficient management of the system. Data is programmed on the Area Support Command (ASCOM) Computer. The system is designed to provide for emergency manual operation in the event of loss of computer support.

CHAPTER 3

TOPOGRAPHIC OPERATIONS, GENERAL

Section I. MAP PRODUCTION PLANNING AND OPERATION

3-1. Centralized Control

Centralized control and direction of the command mapping program must be vested in the engineer or mapping staff to insure accuracy, adherence to specifications, economy, efficiency and maximum production. Such control permits an economical integrated mapping program, and will prevent wasted effort by eliminating nonstandard products and duplications. Control of map supply and distribution will avoid overtaxing reproduction capacities and prevent excessive reserves or critical shortages. The actual distribution of maps, however, should be decentralized to permit major subordinate commands to control their own map depots, which should move forward with the tactical operation.

3-2. Topographic Staffs

Adequate topographic staffs should arrive in the theater early in order to determine requirements, establish mapping policies, and to initiate the theater mapping program.

3-3. Map Production Phases

The normal sequence of map production phases are—

a. The collection, collation, and evaluation of basic mapping data, including the procurement of aerial mapping photography and procurement, or establishment of control.

b. Field survey phase, including the establishment of horizontal and vertical ground control, and such plane table operations as may be necessary to fill in detail not covered by aerial photographs. Field edit of final products is generally conducted by survey personnel.

c. Photomapping phase, including the extension of control by photogrammetric methods, the compilation of map manuscripts, the prepa-

ration of final color separation and the editing of maps for publication.

d. Map reproduction phase, including reproduction in one or more colors.

e. Map supply and distribution includes distribution scheduling and stockage planning, requirement computation, stock control and records, initial replenishment and replacement issues, storage of regular and reserve stocks and other miscellaneous or special distribution operations.

3-4. Evaluation of Available Mapping Data

Before planning a new mapping program all available mapping material, including existing maps, aerial photographs, and ground control, should be obtained and evaluated. Foreign maps will normally require translation and out-of-date maps should be checked for pertinent information. Depending upon the amount of ground control available, on-the-ground control surveys may be unnecessary or impracticable. Existing coverage and quality of aerial photography is one of the prime considerations in any new mapping program. From a study of available mapping data, plans are initiated to provide for required additional aerial photographic coverage, ground control, and revision. A new map normally is evolved through all phases of map production.

3-5. Field Survey Phase

a. The various elements of surveying such as the determination of azimuths and astronomic positions, triangulation, traverse, leveling, plane table operations, and computations by grid and geodetic methods are the means by which the engineer survey units contribute their share to the mapping program. Survey technique is well established by texts, technical manuals, and wide experience.

b. Survey unit commanders and engineer staffs are concerned not only with the degree of proficiency with which survey units can perform survey operations, but also with the selection and adaptation of survey methods to particular problems. The characteristics of the terrain, the time available, and the degree of accuracy required have a decided bearing upon the choice of method employed.

c. The appropriate engineer staff assembles and maintains complete files of ground control data (Geodetic Library) and disseminates these data in usable form to engineer topographic units, the artillery, and other interested agencies. Data, commonly known as trig lists, is compiled from captured or friendly documents or from field data supplied by topographic survey units. Data collected from different sources is reduced to a common datum before incorporation in a trig list.

d. Generally, operations will be conducted in areas where some survey datum exists. Under

such circumstances survey units will only be required to extend control throughout the area to be mapped. At times, however, operations may be conducted in unsurveyed areas. As a consequence, survey units will be required to establish either a first or second order survey datum, from which mapping control can be extended. The decision will depend on time available and size of area to be covered. The headquarters responsible for the overall mapping problem will decide what accuracy specifications a new datum will meet.

3-6. Photomapping Phase

a. Photomapping operations consist of applying map compilation, photogrammetric, photographic, and map drafting techniques to the preparation of maps. The operations begin with the extension of control by photogrammetric means, the compilation of data from aerial photographs, surveys, and other source material, the preparation of final color separations, and the final edit of the completed map. The

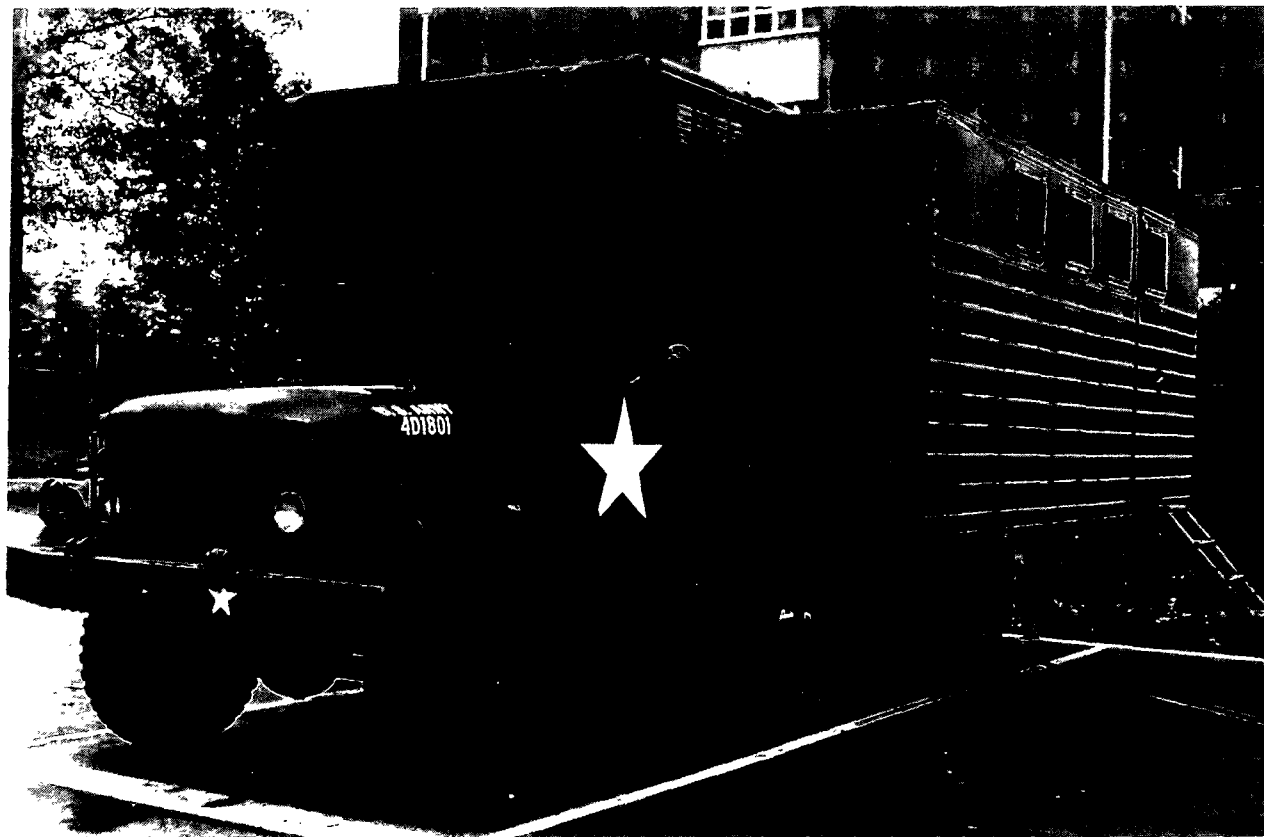


Figure 3-1. Expansible van, expanded (Photomapping).

preparation of mosaics is also a photomapping operation. Corps and army photomapping units are equipped to operate in van-type trucks.

b. In the theater of operations military mapping is less frequently concerned with new mapping than with partial or total revision of maps which have been prepared by other agencies.

c. Engineer photomapping units should concentrate on establishing improved procedures for revising existing maps, constructing photomaps, and preparing map overlays, map substitutes, and overprints.

d. Photomapping engineer staffs should concentrate on obtaining good source material and improving procedures. The quality of the photomapping output and the time required to complete it depend upon the accuracy and amount of ground control supplied, the quality of the aerial photographs, and other source material. The state of training of the technical personnel, the condition of the technical equipment and supplies, and the physical conditions under which the work must be accomplished are also factors to be considered.

3-7. Map Reproduction Phase

a. Map reproduction operations include lithography, photography, and other processes.

b. In scheduling reproduction work, engineer staffs should consider the differences between the equipment used by corps and army reproduction units, and that used by base units.

(1) The corps reproduction unit and the army reproduction unit are 100 percent mobile. The van-type trucks are compactly designed, and the units have adequate equipment and can carry sufficient supplies to perform normal reproduction missions without curtailing their mobility. The map sizes, however, are limited to the sizes of the organic presses (normally 22½" x 30") and cameras.

(2) The lithographic offset printing equipment authorized the Engineer Base Reproduction Company includes both the 22½ x 30 inch and 35 x 45 inch printing surface, stream fed, single color presses. These presses provide for quantity production in fixed facilities.

c. Since the map reproduction phase is essentially that of providing sufficient press capacity

and reproduction materials, careful equipment and supply planning and scheduling are important responsibilities of the engineer staffs.

d. Planning staffs should make provisions for a reserve press capacity of sufficient impressions per month to accomplish emergency projects.

e. Arrangements should be made by planning staffs for the maximum exploitation of seized civilian lithographic printing plants, or purchase and contract facilities.

3-8. Production Capacities

a. In determining production capacities, engineer topographic unit commanders and their staffs should first consider the degree of accuracy, amount of detail and number of copies for each product. These factors will determine the time required to complete the project.

b. Other factors to be considered are:

- (1) Availability of topographic supplies and relative priority of work.
- (2) Serviceability of equipment.
- (3) Skill and training of technical personnel.
- (4) Efficiency and morale of the unit.
- (5) Suitability of working conditions.
- (6) Tactical situation encountered in the field.

3-9. Map Supply and Distribution (MSD)

a. Map and chart requirements for military use originate at the moment that military planners conceive of possible operations. Preparation for map supply and distribution should be undertaken early in the operation planning. The ultimate success of MSD operations depends upon prompt staff action, close coordination, and rigid control from the start of the operation planning phase. The tactical commander's planning staff should recognize the relative complex nature of MSD operations and draw upon the technical capabilities of the engineer staff at the earliest phase of planning. Tactical units are often unaware of their missions at the time map distribution must be arranged. Miscalculations will result in critical shortages or wasteful surpluses. Rigid control over the final distribution phase is particularly vital because of the suddenness and frequency

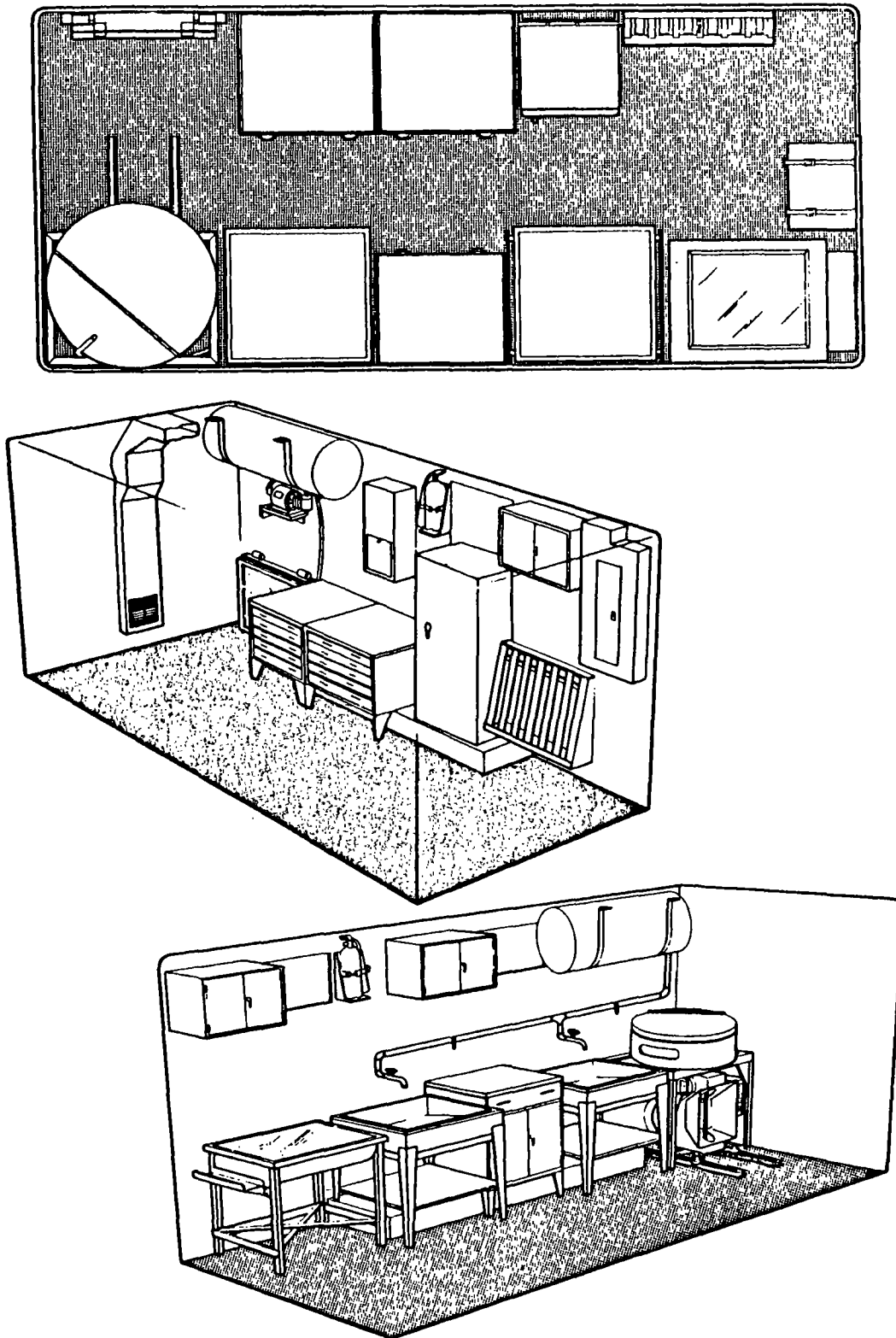


Figure 3-2. Interior arrangement of the mobile plate processing van.

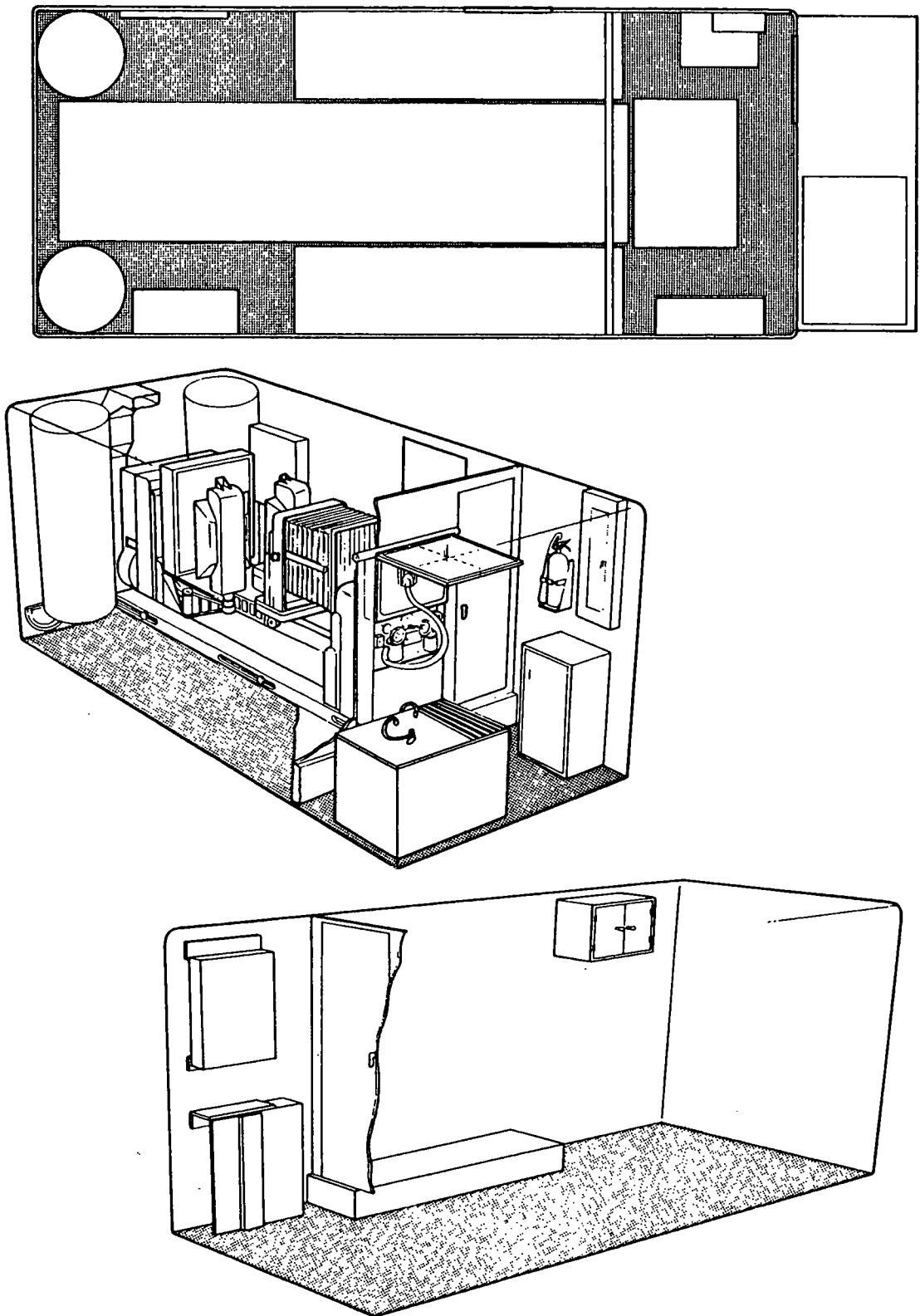


Figure 3-3. Interior arrangement of the mobile process camera van.

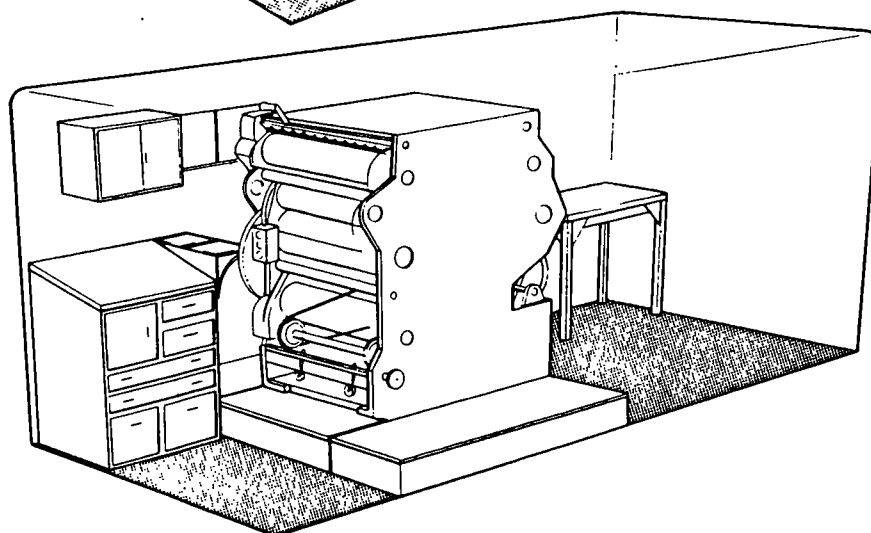
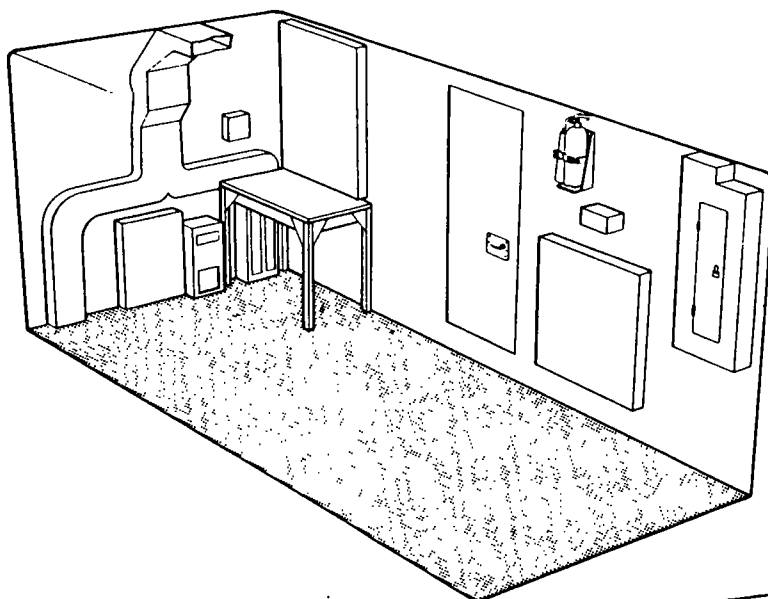
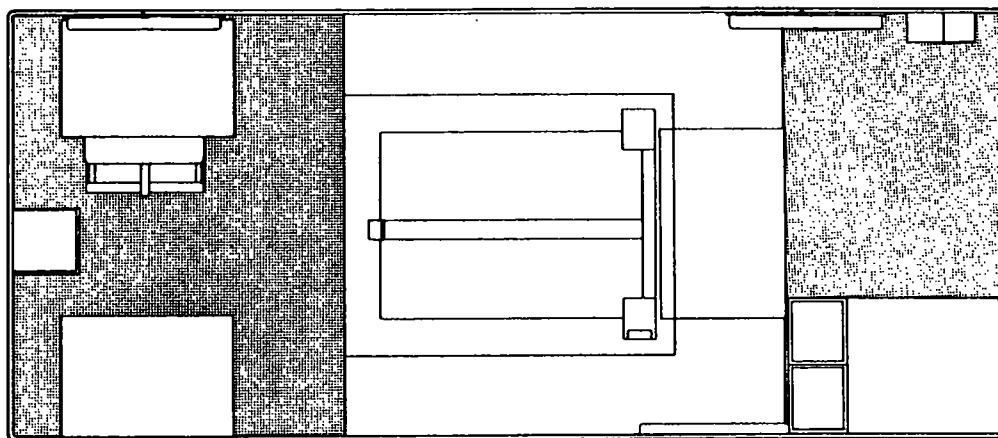


Figure 3-4. Interior arrangement of the mobile press van.

of change in requirements within the tactical area.

b. Unlike most logistic type items, maps and charts can only be used for operations in the area they cover. Forces assigned to operate in an area must be provided with maps and charts of that area and have no use for those maps of other areas, other than those on their immediate flanks and rear, and terrain held in depth by the enemy. Should these forces be relieved or reassigned to another area, they will require immediate issue of maps and charts required for operations in the new area. Moreover, in the conditions of modern warfare, maps and charts must be considered as expended once they have been issued to units, unless issued in bulk packets which can be held in a reserve status pending final distribution action. It is most unlikely that any significant quantity of unwanted maps or charts will be returned to map depots in a usable condition. Reserve stocks must, therefore, be sufficient to meet the needs of forces assigned to the area as well as any new forces which may be assigned to operate in the area during the first 90 days of operation.

c. In order to define essential stocks of maps to be held available, it is necessary to evaluate such factors as:

- (1) The essential map and chart series required for the operation.

- (2) The possible areas of operation in order of priority.

- (3) The maximum size of force for which map and chart stocks will be required.

- (4) The initial and replacement allowances considered adequate for standard type units with due consideration for the type of operation involved.

- (5) The time frame required for replenishment of stocks.

d. Maps are treated as intelligence documents. The staff intelligence officer of each command is responsible to the commander for determining map requirements needed to support planned operations and assuring that adequate map materials can be made available. He issues command policy concerning initial map allowances, replenishment, security measures,

strategic and tactical plans of operations, and tests of units involved in the distribution plan. The engineer prepares the map distribution plan and assists the staff intelligence officer in the computation of requirements and advises the planning staff on the technical aspects of map utilization.

e. The engineer map supply and distribution plan should include:

- (1) The organization of the distribution system in the various echelons of command including the location of map depots.

- (2) Determination of initial and replenishment allowances.

- (3) Determination of stock levels and storage, including reserve stocks to meet reasonable contingencies.

- (4) Destruction of maps when replaced by new editions.

- (5) Security measures including packaging, coding, and guarding deliveries.

- (6) Delivery scheduling and transportation required.

- (7) Alternate plan in case operational plans are modified.

f. The theater Army G2 in conjunction with the theater Army engineer establishes policies for the distribution of maps within the theater. Normally, base engineer map depots will be established in the theater, and map stocks required from CONUS will be requisitioned from the Army Map Service by the ENCOM. The theater commander allocates priorities for air and surface shipment of maps and related materials consistent with the theater map plan. Bulk distribution will be handled through map depots at various echelons. Map depots are usually provided as follows:

- (1) Theater Army Map Depot, located in the communications zone and operated by the base topographic battalion. This depot furnishes maps to army map depots and to COMMZ units.

- (2) Army map depots located in army service areas and operated by army topographic battalions. These depots furnish maps to corps map depots and to army units including

the Field Army Support Command (FASCOM).

(3) Corps map depots located in corps rear areas and operated by corps topographic companies. These depots furnish maps to corps troop units and to division support commands.

g. In divisions, map supply is handled by the division support command (DISCOM). The division supply and transport battalion obtains maps for the division from the supporting map depot and distributes them to using units.

h. Bulk production, movement, and issue of maps are accurate indications of the scope and location of forthcoming operations. Consequently, appropriate security measures must be enforced in relation to map supply.

i. Figure 2-3 illustrates the flow of topographic products in a theater of operations.

3-10. Operational Methods

Paragraph 6-8 outlines the flow of map production through the various battalion headquarters sections and the companies of the engineer topographic battalion, army. Appropriate technical manuals describe the technique of operational methods used in engineer topographic units. Normally, the work flows through the topographic unit in the sequence of the map production phases given in paragraph 6-8*g*.

3-11. Schedules, Reports, and Inspections

Time schedules, accurate and current reports, and command and technical staff inspections are essential to the control and coordination of the mapping program.

a. Detailed time schedules are prepared by the staff sections to control map production. These include labor scheduled for troop, and indigenous labor when available; equipment schedules for the operation and maintenance of organic and seized equipment; and supply schedules for procurement, delivery, stocking, and issue of topographic supplies.

b. Accurate current reports are essential for sound planning, skillful control, and proper supervision. However, reporting requirements

should be carefully considered and be held to a minimum. A personal visit will often answer the purpose of a report and establish more friendly relations between staff and troop units.

c. Periodic reports, however, on personnel, equipment and supply, and the progress and completion of mapping operations are required by staff sections to check against schedules to:

(1) Measure map production accomplished to date.

(2) Determine rate of progress of map production in relation to compilation dates.

(3) Analyze labor and equipment performance.

(4) Estimate future mapping operations.

(5) Prepare progress and completion reports for higher headquarters.

d. Command and technical staff inspections insure that plans and schedules are being met. The schedules, reports, and map production flow charts serve not only to control the map production phases but also to guide the topographic commander and his staff during their inspections.

(1) Command inspections are made by battalion and company commanders to check the efficiency of personnel, insure compliance with prescribed operating procedures, determine if topographic equipment is efficiently assigned to tasks, and correct unsatisfactory conditions.

(2) Technical staff inspections are made by staff personnel to insure adherence to mapping specifications, compliance with higher headquarters directives, the use of sound map production practice, and to determine the quality and completeness of map production.

3-12. Map Depot Operations

a. A map depot prepares and makes available bulk issues (wholesale) for receiving units (unit commands). The receiving unit performs the detailed breakdown and makes the individual issues. Map depots provide distribution facilities at each echelon of command down to and including the corps. Base, army, and corps depots each receive map stocks from the depot

of the next higher echelon and from the engineer topographic units within its own command echelon.

b. Map depots normally are located in the service areas of their respective commands (para 3-9f).

c. Depot sites should be located to provide adequate security, storage and work areas, and ease of operations. Access to the depot should be easy and well marked. Access roads to air, rail, or water transportation facilities should be considered when locating a depot to reduce transportation. Base map depots consistently shipping or receiving large quantities of maps should be located either at or near as possible to the most used transportation facility. Warehouses used for map storage should be weather-proof, secure against pilferage and sabotage, and have a floor bearing capacity equal to or greater than the computed map storage load (fig. 3-5). Approximately 25 percent should be allowed over the computed storage area requirements for expansion to accommodate future new map productions, contingency, and rewarehousing operations. When computing map depot space requirements, all map publications in progress, but not completed, should be included in the volume figures to eliminate rewarehousing which would normally occur immediately upon setting up a depot. Space required for a depot to include all covered space requirements (office, receiving, shipping, aisle and storage areas) may be computed as one square foot of floor space for every 1,000 copies of maps to be stocked where containers are arranged 8 feet in height (which should not be exceeded in a map depot) with 3-to 4-foot wide secondary aisles and 8-foot wide main aisles. Storage areas should be arranged into container rows not to exceed 30 feet in length to provide efficient operations by minimizing transportation and providing easy access to containers. A main aisle should either traverse the storage area or extend through the depot from the receiving to the shipping areas for efficient work flow and use of handling equipment. Office space should be provided on the basis of number of personnel required for stock control and administration. Normally, 300-500

square feet of office space will suffice and this space should be near the shipping area of the depot. Approximate covered storage requirements for the various map depots are as follows:

(1) A base map depot for each group of three field armies requires 45,000 square feet.

(2) An advance map depot serving a field army requires 10,000 square feet.

(3) An army map depot requires 8,000 square feet.

(4) A corps map depot requires 3,500 square feet.

d. Depot operations normally are divided into five functions; receiving, stock control, storage, shipping, and administration. Where the volume of work is large, map depot operations require a well defined and controlled step system under the supervision of experienced personnel to be fully efficient and effective. Personnel assigned to supervisory positions in map depot operations must have administrative and supply qualifications to cope with the varied requirements involved in map distribution and depot control functions.

e. The destruction of maps is an extremely difficult and time consuming operation. While explosives and burning with gasoline accelerate the operation, these methods are not entirely satisfactory and seldom result in complete destruction. Mechanical shredding or pulping provides the best results, but these methods are more time consuming and require special equipment. To preclude the destruction of other than obsolete map stocks, storage of maps in forward areas should be kept to a minimum and maintained in mobile type storage whenever possible. Responsible personnel must continuously be on the alert to direct rearward movement of map stocks when in danger of capture. When endangered stocks cannot be moved, all possible destruction action should be taken.

f. Like other topographic units, map depots should establish rigid measures to safeguard military information. Paragraph 3-22 describes the measures to be taken to safeguard military information.

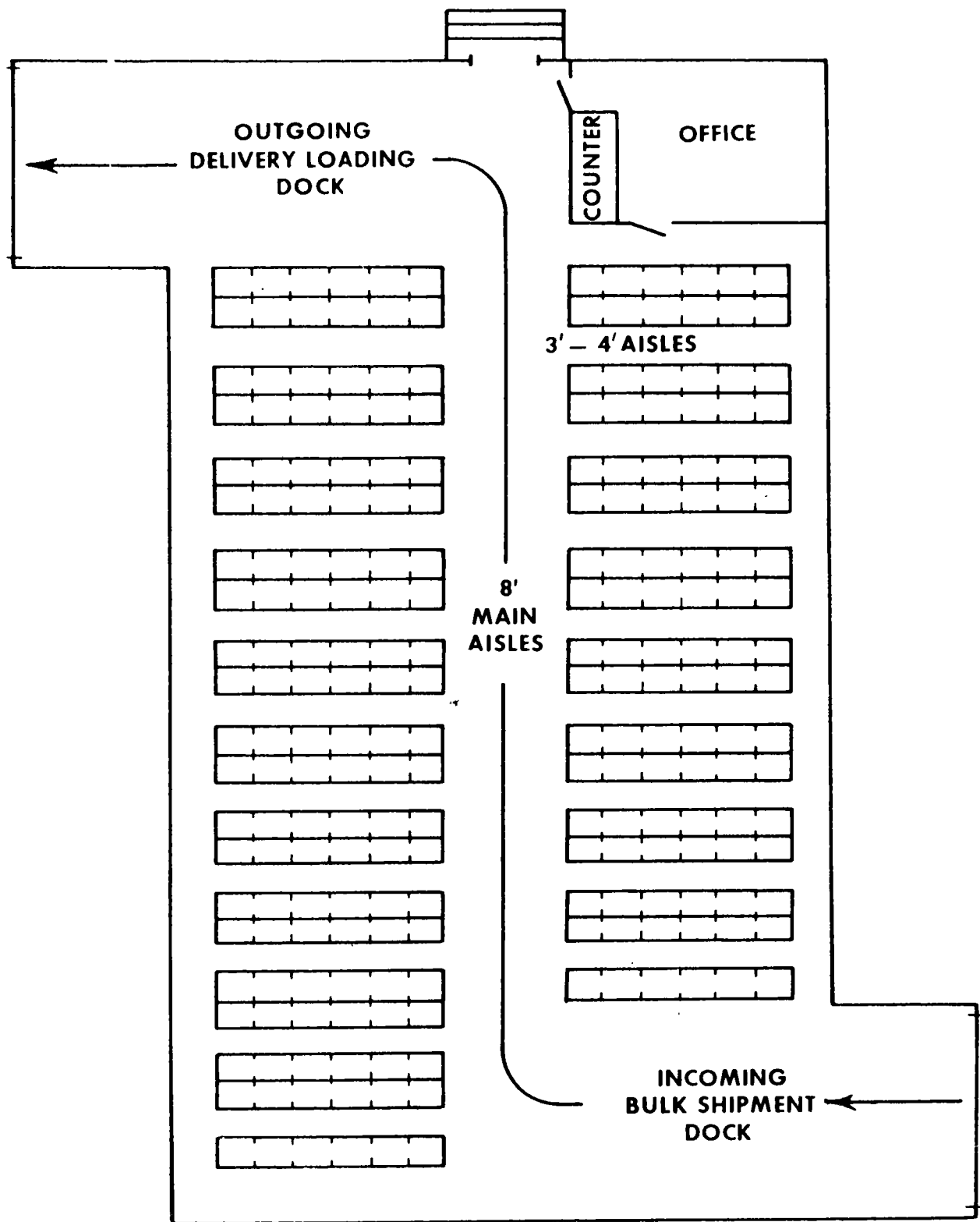


Figure 3-5. Typical layout of a map depot.

Section II. SPECIAL CONSIDERATIONS

3-13. Shift Operation

Some elements of engineer topographic units are designed for a two-shift per day operation. The offset lithographic press sections of both the base and army topographic reproduction companies and the engineer base photomapping company are manned and equipped for a two-shift operation. Other cartographic lithographic, storage and distribution, and supporting elements require augmentation to conduct a two-shift operation. Topographic survey units do not operate by shifts in the normal sense of shift operation. Survey units, by the nature of their work may operate at all hours. Triangulation usually is accomplished at night; traverse, trilateration and leveling during the day. The requirements of the assigned project determine the survey unit's working hours.

3-14. Topographic Supply

The variety, complexity, and specialized nature of topographic equipment and supplies, including the great variety of perishable photographic and lithographic items, makes it essential that supply planning include detailed, periodic checks on unit stocks and close liaison with the depot from which replenishment stocks are obtained.

a. Supply schedules and production, supply, equipment, and status reports form the basis on which the supply officer controls critical items of equipment and supply. Such control requires frequent coordination with both the operations officer and the maintenance officer. These schedules and reports are also used to analyze performance and as the basis for estimating future supply requirements.

b. Topographic equipment and supplies require handling by trained personnel. Supply troops are not always trained or qualified to identify optical and lithographic equipment; nor to identify, stock, and issue the great variety of perishable photographic and lithographic materials. The depot personnel sometimes need and welcome technical assistance. The commander of the engineer topographic unit should

establish close liaison with the commander of the supporting depot and, when requested, provide technically qualified personnel for short periods of time to assist in training personnel of the depot in the recognition and storage of topographic supplies and the repair of topographic equipment.

c. Topographic units normally maintain a 30-day supply of map paper. The average daily consumption of map paper of the corps topographic company is 600 pounds; that of the army topographic battalion, 1.8 tons; and that of the base topographic battalion, 2.5 tons.

3-15. Equipment Maintenance

Maintenance of engineer topographic equipment and wheel vehicles is a vital factor in determining the operational capabilities of topographic units.

a. The Headquarters and Headquarters Detachment, Engineer Base Topographic Battalion, provides organizational maintenance for its own vehicles and those of the map depot, reproduction and photomapping companies and attached teams. The photomapping and reproduction companies provide organizational topographic equipment maintenance. The survey company provides for its organizational maintenance of vehicles and direct support maintenance of topographic equipment. The Base Map Depot Company is dependent on Headquarters and Headquarters Detachment for organizational equipment maintenance.

b. The Headquarters and Headquarters Company, Engineer Topographic Battalion, Army, provides for its organizational vehicle maintenance, support of vehicle maintenance for assigned units and direct support maintenance of reproduction, electronic and optical survey equipment. All Army topographic companies have an organizational capability for maintenance of vehicles and equipment.

c. The Engineer Topographic Company, Corps, has an organizational capability for maintenance of its vehicles and direct support maintenance of topographic, special electronic devices and reproduction equipment.

3-16. Supply Economy

Supply economy is a command function. Topographic supplies and finished maps must be carefully controlled to prevent waste. A positive conservation program, carefully supervised, will preclude the need for maintaining excessive reserves which overtax production and storage capacities. Careful planning of programs and requirements, proper maintenance of equipment, and efficient use of labor and transportation, enforced by frequent command and staff inspections, will insure effective economy of supplies.

3-17. Water Supply

An adequate supply of suitable water is an operational necessity for map reproduction operations. Map reproduction units must be provided with water that is free from visible and organic impurities such as algae. To meet this need, the reproduction platoon of the corps topographic company is authorized a 1½-ton (400 gal) water tank trailer. A water trailer is also provided for the cartographic platoon. The map reproduction and distribution company of the army topographic battalion is authorized two 1½-ton (1000 gal) water tank trucks and two 1½-ton (400 gal) water tank trailers. Units of the base topographic battalion normally operate at fixed installations and obtain the necessary water from the installation water system.

3-18. Electric Power

Electric power normally is provided by organic generators for field operations. The loss of any of the authorized generators will impede operation and may render the unit incapable of accomplishing its mission. For any unit in a static situation, power should be provided or augmented by local sources.

3-19. Housing

Wherever possible, weatherproof work areas should be provided for the protection of precision equipment and to enable the technicians to perform their duties more efficiently. This is particularly true of photomapping, reproduction, and map distribution units. School build-

ings make excellent facilities for photomapping operations. Warehouses, large garages, or factory buildings can be adapted to house van-equipped units. Use of a building improves efficiency, since supplies and products may be moved freely from site to site protected from the weather. Handling of supplies is decreased, and storage facilities may be made more accessible (fig. 3-6 and fig. 3-7).

3-20. Safety

Although the topographic profession generally is not considered a hazardous occupation, certain equipment, chemicals and operations have caused serious accidents. If these hazards are made known and reasonable care is taken these past accidents need not be repeated. The hazards mentioned here are those associated with the mapping operation and do not include the normal hazards associated with the operation of vehicles and aircraft or enemy action.

a. Personnel conducting field survey operations in either manmade or natural environment are exposed to the hazards of falling rocks, debris, and other objects. Operations conducted in arctic areas require special cold weather training and equipment for successful completion. Survey personnel working on steel triangulation towers are subject to accident such as slipping, falling or electrocution.

b. The map reproduction procedures call for the use of equipment and chemicals that, if precautions are not taken, can prove dangerous to operating personnel. The arc lamps in the mobile process copy camera can cause serious eye injury by personnel simply looking at these lights. The sharp tools used for etching can cause cuts or puncture wounds if not properly shielded. Fumes from cleaning solvents such as carbon tetrachloride and benzol are toxic. The exposed rollers, gears, chains, sprockets and cylinders of presses and the power-operated blade on the paper cutters can cause serious injury.

3-21. Climate

Engineer topographic units will be required to operate in climates of extreme heat, cold, humidity, and rainfall. These climatic conditions require remedial action.

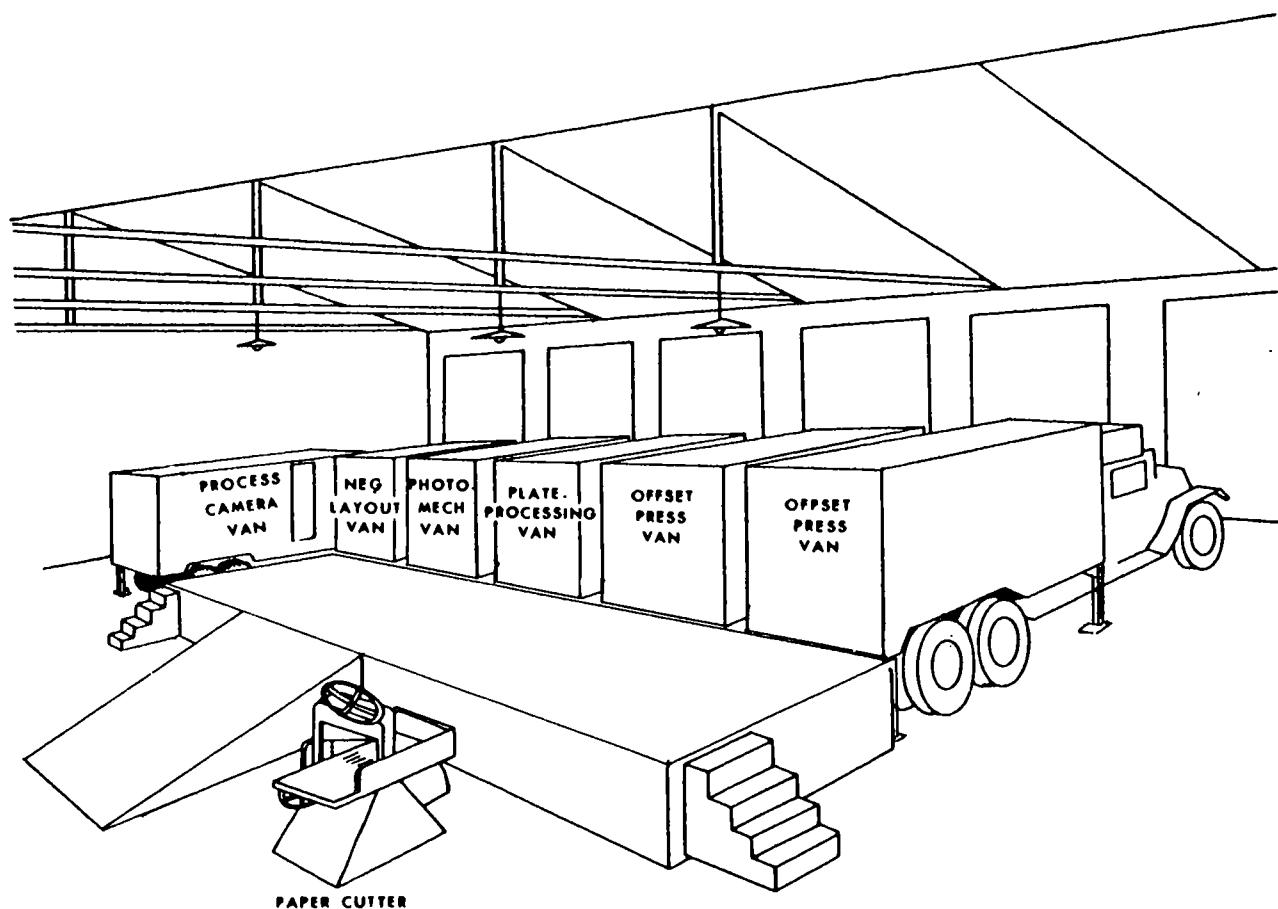


Figure 3-6. Possible garrison layout of map reproduction train.

a. Mapping operations under jungle conditions create problems. Dense jungle growth and swamps limit mobility and visibility. Operations are marked by difficulty in land movement and visibility caused by torrential rains and tropical storms.

(1) Heat and humidity increase maintenance problems and affect operations adversely. Metals, wood, cloth, leather, photographic and optical lenses deteriorate rapidly and require constant care. Extraordinary care must be taken of press plates to prevent scumming and oxidation which may make the employment of special processes necessary. High humidity introduces excessive dimensional changes in papers, films, and plastics used in compilation, photography, and printing, and procedures must be adjusted to suit these conditions. Photographic processing is affected by the effects

on emulsions and formulas. Particular care must be exercised in laboratory work, and formulas and mixing techniques are adjusted to compensate for the influences of temperature and moisture on chemical reactions. Tropical conditions may require that measures be taken in the treatment and use of water.

(2) The dense vegetation, deep mud, and absence of roads in the jungle increase the difficulty of field survey operations. Air support by helicopters and fixed wing craft may be required for successful operations.

(3) For more complete information about jungle operations see FM's 5-1, 31-30, and 100-5.

b. Desert operations are characterized by excessive heat and sand, scarcity of water, and lack of natural concealment. However, except in deep sandy areas, the normal wheel vehicles

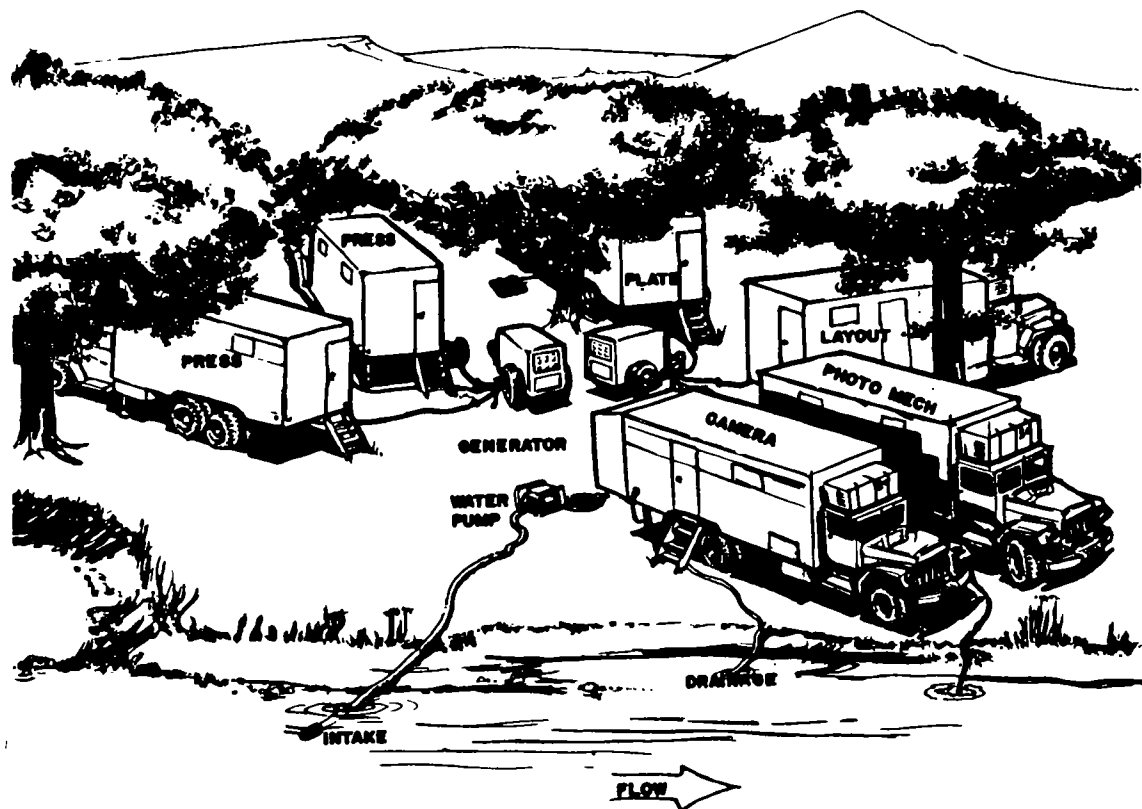


Figure 3-7. Possible field layout of map reproduction train.

have unrestricted mobility for both on and off road movements. Maintenance planning should include provisions for special equipment such as auxiliary cooling systems and heavy duty air cleaners, as well as increased repair parts needed to overcome heat and sand action. Because of dust and sandstorms, bivouac and working areas should be carefully selected for the reproduction and photomapping units. Because of the scarcity of water during desert operations, all water supply support should be augmented by additional personnel and equipment. This is particularly important for reproduction equipment which must be provided a constant supply of water. In addition, excessive drying of inks, misregistration of printed images, and the instability of cartographic film emulsion should be guarded against. Ink and sensitizer formulas should be adjusted and paper pre-conditioned for registration. For more complete information about desert operations, see FM's 5-1, 31-25, and 100-5.

c. For operations in extreme cold, arrangements should be made for continued heating of the van interiors both during the operations and while inactive to prevent freezing of water and solutions and to maintain the press and other units at operating temperatures. Such arrangements will avoid costly delays, prevent corrosion, and permit normal operating procedures.

(1) The maintenance and repair of topographic and reproduction equipment become more difficult in extremely cold climates. Pumps, tanks, and circulating systems for mobile reproduction units should be completely drained when vans are inactive and unheated. Additional repair parts should be provided for equipment sensitive to cold weather operations.

(2) Field operations, particularly surveying, at temperatures ranging from 10°F and lower, become increasingly difficult. Men are subject to the health hazards of frostbite, freezing, and exhaustion. The resulting loss in

efficiency both in personnel and surveying capacity will require additional manpower to be assigned to survey units. Snow and ice will limit visibility, and lack of roads makes it difficult for field parties to operate normally. Men should be provided special cold weather clothing, high caloric rations, and arctic-type housing. Air transport for both reconnaissance and surveying operations becomes exceptionally important.

(3) For more complete information about cold weather operations, see FM's 5-1, 31-70, 31-71, and 100-5.

3-22. Safeguarding Military Information

a. Mapping operations precede much of the planning for future military operations. The security officer is charged with the responsibility for establishing rigid measures to safeguard military information during the planning stages and throughout mapping operations.

b. Strategic areas, selected in advance of military operations, should be reserved from general knowledge, and all correspondence, assignment of mapping priorities, and collection of compilation material should be classified as highly as the situation dictates.

c. During classified military operations that warrant a coding system for the distribution of maps, the security officer, in coordination with the operations and map distribution officers, may recommend to the battalion commander that—

(1) Map reproduction and distribution centers be placed under armed guard.

(2) Personnel be screened before assignment to reproduction and distribution activities.

(3) Working groups be quarantined during critical periods.

(4) Double check systems be prescribed for counting and coding of map shipments, and destruction of waste stocks.

(5) Special pass system be established to control entrance of personnel into critical working and distribution areas.

(6) Company and unit commanders and all members of the battalion staff, by personal

inspection, insure that security measures are being rigidly enforced.

3-23. Tactical Operations

a. Corps, army, and theater headquarters, near which engineer topographic units usually are bivouacked are important enemy targets subject to sabotage and subversive action from within; liable to ground attack, including partisan or guerrilla action; to aerial bombing and strafing; to airborne assault; and to chemical, biological or radiological attacks.

b. While other troops are responsible for the security and local defense of the headquarters area in which engineer topographic units may be bivouacked, the engineer topographic unit commander is at all times responsible for the security and defense of his command.

c. The operations section of engineer topographic units in coordination with the other staff sections prepares an operation plan covering defense against all possible types of attack. To be effective, the plan should be developed simply and not contain unnecessary detail. The principles stated in FM 7-20 and FM 5-135 are the essential elements of such a plan.

d. The use of topographic troops for combat may be very costly in terms of replacement of critical skills which might adversely affect subsequent operations. When an emergency situation, such as a breakthrough, requires combat employment of topographic units, they should be returned to normal duty at the earliest possible time.

3-24. Stability Operations

a. General.

(1) Many developing nations of the world subjected to subversive insurgency depend upon the U.S. for assistance. The military portion of this assistance is provided through the conduct of stability operations. These operations include the full range of military, paramilitary, political, economic, psychological, sociological, and civic actions taken by the US Army to assist developing nations in preventing or defeating subversive insurgency.

(2) In view of the length of time required to train and equip host country (HC) forces, it

may be necessary to introduce selected U.S. Army units to assist HC forces in combat support and combat service support missions. When insurgency is latent or incipient, U.S. Army resources may be employed to assist HC forces in providing a stable environment for attaining the internal development objectives of the HC. If the insurgents resort to tactical operations or related forms of violence, U.S. Army participation may be expanded to include combat, combat support, and combat service support. When an insurgency reaches the stage where the HC forces cannot contain or defeat the insurgent forces, major U.S. Army tactical forces may be deployed at the request of the HC government.

(3) U.S. Army engineer topographic organizations should be prepared for commitment in a stability operations role. This commitment could range from furnishing mobile training teams (MTT) to the overall control of mapping operations within a host country. For further doctrine concerning stability operations, see FM 31-23.

b. Engineer Topographic Units in Stability Operations. These operations may include the following major areas of activity:

(1) *Providing maps.* Since stability operations are commonly conducted in remote and sparsely inhabited areas, available map coverage and geodetic control data will most likely be incomplete or nonexistent. Should map stocks be available, however, topographic units can print and distribute them as needed. Aerial photo mosaics can also be provided to supplement map stocks with more detailed, large scale, information. When no maps are available, mosaics become even more important as a quickly available substitute while topographic units carry out the more time-consuming task of compiling standard maps.

(2) *Military civic action.* Military civic action involves the participation by military and paramilitary forces, using their military skills, equipment, and resources, in economic and sociological projects which are useful to the HC and its population. Topographic units possess special technological skills to assist in the preparation of necessary maps and charts required

for planning road, railroad, and airfield projects; irrigation and land development; political subdivisions and boundaries; and land use. Topographic units may also participate in other civic action projects, such as digging wells, building schools, providing medical treatment, and distributing food and clothing.

(3) *Advisory assistance.* These operations are designed to increase the capabilities of HC organizations to operate efficiently and to perform their missions in the given operational environment. Topographic unit capabilities for advisory assistance include:

(a) Providing training and operational assistance and advice to HC military and paramilitary organizations.

(b) Conducting map coverage and geodetic control data surveys to provide a basis for increased mapping assistance for both military and civil purposes.

(c) Providing selected personnel for employment as mobile training teams (MTT) prior to unit deployment.

(4) *Terrain intelligence.* This type of intelligence is the product of the collection, interpretation, and evaluation of information concerning natural and manmade terrain features, weather, and climate. This information is usually presented in the form of a terrain intelligence study. For stability operations, intelligence studies are primarily concerned with supporting foot, vehicle, and airmobile operations. Emphasis is placed on the analysis of trafficability, vegetation, lines of communication, potential landing zones, and weather. Topographic units may assist other U.S. and HC organizations in preparation of these studies.

(5) *Geodetic survey work.* Whenever possible, geodetic surveys are conducted in conjunction with survey agencies of the HC. This allows surveyors from topographic units to work closely with HC teams in establishing the positions and elevations required for making accurate maps. When survey operations involve work in areas not under HC governmental control, consideration should be given to providing additional security for these survey parties.

(6) *Printing support.* When other printing facilities are not available, when such projects do not interfere with the primary missions of the unit, and when the necessary ap-

proval is obtained, topographic units may print proclamations, identity cards, ration cards, directives, posters, and similar material in support of stability operations.



CHAPTER 4

ENGINEER TOPOGRAPHIC ORGANIZATION

4-1. Missions

The missions prescribed for engineer topographic organizations are reflected in applicable tables of organization and equipment.

a. The primary objective of topographic organizations is to provide the combat forces with the most accurate and current maps, survey control and related information at the time and in the quantities specified for planning and support of tactical operations.

b. A continuing objective is to improve map and survey coverage as time permits.

c. Generally, the mission of engineer topographic units is to support the operations of the headquarters to which assigned. See paragraph 1-6 for a detailed statement of the topographic support provided by engineer topographic units.

4-2. Topographic Support in a Theater of Operations

a. The engineer topographic company, corps, and the engineer topographic battalion, army, provide capabilities for surveying, map compiling, map reproduction, and map distribution, all of which are normal topographic support functions of the corps or army headquarters to which they are assigned. A mapping program involving all four of these functions may be classified as a balanced program. The capability for map compilation is generally limited to provisional maps, uncontrolled and controlled mosaics and survey control to second and lower order accuracy.

b. The engineer base topographic battalion, because of its more flexible organization, is more adaptable to unbalanced mapping programs in which expenditure of effort is required to be concentrated on one or more phases

of map production. For example, where the mapping program requires only surveying, the base topographic battalion may be activated with a headquarters and headquarters detachment, several engineer base survey companies, but minus any photomapping, indigenous augmentation reproduction, or distribution companies. The battalion reinforces and rounds out the corps and army topographic efforts into a coordinated mapping and charting program to meet normal theater requirements. It provides a means for accomplishing long-range mapping projects for a theater of operations.

4-3. Assignment

The assignment of any topographic unit is determined by mapping requirements and the availability of engineer topographic units. However, the assignment is closely related to the mission prescribed in tables of organization and equipment applicable to the various units. The engineer topographic company, corps, is normally assigned to a corps; the engineer topographic battalion, army, to a type field army, or army group; the engineer base topographic battalion to an army in the zone of interior or the engineer command in a theater of operations. As the mapping situation changes, topographic units may be assigned to headquarters higher or lower than that to which normally assigned. Topographic units in support of stability operations may be assigned to MAAG, subordinate unified command, and contingency task forces.

4-4. Employment

The extent of the employment of a topographic unit is governed by personnel and equipment. For example, the engineer topographic company, corps, is neither organized nor equipped to perform extensive original map compilations.

The company, therefore, can be employed in a situation requiring original map compilations only if its personnel and equipment are augmented. Engineer topographic units are prohibited by regulations to supplement the production of field printing plants in the production of posters, programs administrative publications, and such nonmapping projects which interfere with the mapping mission of the command (for limited exception see para 3-24b(6)). Production of these items is the responsibility of The Adjutant General (AR 310-1). In accordance with AR 117-5, the theater army commander is responsible for the accomplishment of photographic and mapping work directed by the Department of the Army, or required by the theater. Within the broad scope of this regulation, the employment of the mapping capabilities of any topographic unit for other than mapping purposes is generally not authorized.

4-5. Capabilities

Some of the general capabilities of engineer topographic units, corps, army, and base in a theater of operations are to—

- a. Provide staff planning and supervision of mapping operations of attached or assigned topographic troops for base and army battalion only.
- b. Provide administrative, supply, maintenance, operational and tactical control of assigned or attached troops.
- c. Recover, extend, and establish new horizontal and vertical ground survey control, including geodetic control for the use of the field artillery.
- d. Prepare and revise maps, photomaps, sketches, drawings, and related material, including new maps from aerial photography using stereophotogrammetric instruments.
- e. Prepare controlled, uncontrolled or color-intensified photomaps.
- f. Reproduce required quantities of maps, overlays, and related material in black and white or multicolor.
- g. Store and distribute maps and related ma-

terial required by corps, army, and COMMZ units.

h. Prepare, reproduce and distribute engineer intelligence reports.

i. Operate survey information center to collect, coordinate, and disseminate survey information for use of engineer topographic units, and supported elements and disseminate survey information for the use of engineer topographic units, artillery units and other supported elements.

j. Provide supplementary survey personnel for forward engineer topographic units of base and army battalion only.

k. Operate seized civilian mapping facilities and lithographic printing plants (engineer topographic company, corps excepted).

l. In stability operations, assist counterpart topographic units and agencies in the fulfillment of their topographic missions.

4-6. Medical Support

Engineer topographic units are dependent on higher headquarters for arrangement of medical support. Normally, medical support is furnished by field army or communications zone medical units as designated by the medical brigade commander or by a medical brigade commander coordinating with the corps surgeon. Should a topographic unit be reorganized for combat, it must furnish its own litter bearers.

4-7. Mobility

a. The engineer topographic company, corps, less its survey platoon, is mobile to the extent that it can transport its organic personnel and equipment with organic vehicles, but requires additional transportation for an overland movement, map depot stocks excluded. The company is 95 percent mobile.

b. The engineer topographic battalion, army, is mobile to the extent that it can move by echelon, but requires additional transportation to transport paper stocks, map depot stocks excepted. The battalion is 85 percent mobile.

c. The engineer base topographic battalion, less its survey company, is not mobile, due to

its assigned mission and organic equipment. It is not intended that these units be capable of moving by means of their organic vehicles. Once established, the photomapping and repro-

duction companies of this battalion can be moved only with interruption of operations for long periods of time. Additional transportation must be furnished for the move.



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CHAPTER 5

ENGINEER BASE TOPOGRAPHIC BATTALION, TOE 5-346

Section I. ORGANIZATION

5-1. Composition

a. The engineer base topographic battalion consists of a headquarters and headquarters detachment, assigned or attached engineer base topographic companies, and topographic and intelligence teams.

b. The battalion normally will have assigned or attached to it an engineer base survey company, one or more engineer base photomapping companies, one engineer base reproduction company, one engineer base map depot company, and such special topographic and intelligence teams as may be required. A typical organization of the engineer base topographic battalion is shown in figure 5-1.

c. The base battalion is not mobile. When directed to move, major items of equipment must be wholly or partially dismantled and processed for shipment. The battalion either can remain fully operational at the present site until a new operational facility is established at the advanced location or personnel and equipment can move forward on a phased basis, continuing op-

erations in the rear with selected equipment and personnel until such time as the forward element is completely operational. Through proper planning, topographic troops can reduce equipment down time to a minimum.

5-2. Relation to Theater Headquarters

a. One engineer base topographic battalion normally is assigned to the theater army of each theater of operations. The battalion may be assigned to the zone of interior.

b. When the battalion is assigned to the theater of operations, it operates under the direction of the theater army engineer and executes specific map production programs for new and revised maps required to support training and contingency operations. In the zone of interior, the battalion executes long-range mapping programs under the direction of the Chief of Engineers.

5-3. Relation to Other Topographic Units

The battalion provides basic material, such as trigonometric lists and map reproducibles, to

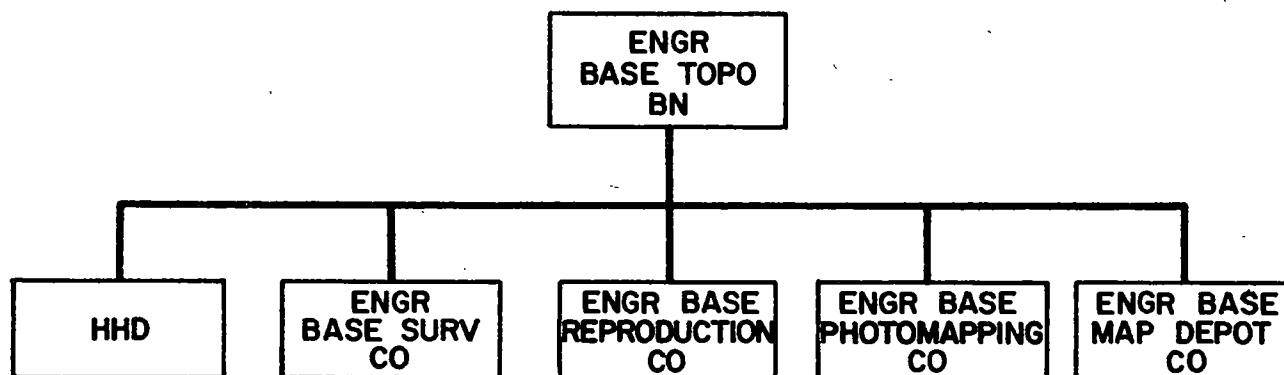


Figure 5-1. Typical engineer base topographic battalion.

the army and corps topographic units. The battalion assists the theater G2 and the theater engineer in the preparation of terrain intelli-

gence reports, evaluates aerial photographs for revision and preparation of new mapping, and assists in topographic research.

Section II. OPERATIONS

5-4. Battalion Headquarters

Battalion headquarters consists of the battalion commander, executive officer, sergeant major and advisory staff. The support for the battalion headquarters is located within the headquarters detachment. See organizational chart, figure 5-2.

5-5. Mission

The mission of the engineer base topographic battalion is to provide:

a. Combat support to a theater army by operational planning and technical control of a

battalion engaged in topographic, artillery and missile fire control survey, and topographic map compilation and reproduction.

b. Geodetic survey control data, trigonometric lists, map reproducibles and other basic engineer intelligence materials to the field army and corps topographic units.

5-6. Capabilities

a. At level 1 (full strength), this unit provides—

(1) Administration, planning, supervision and operational control of an engineer base

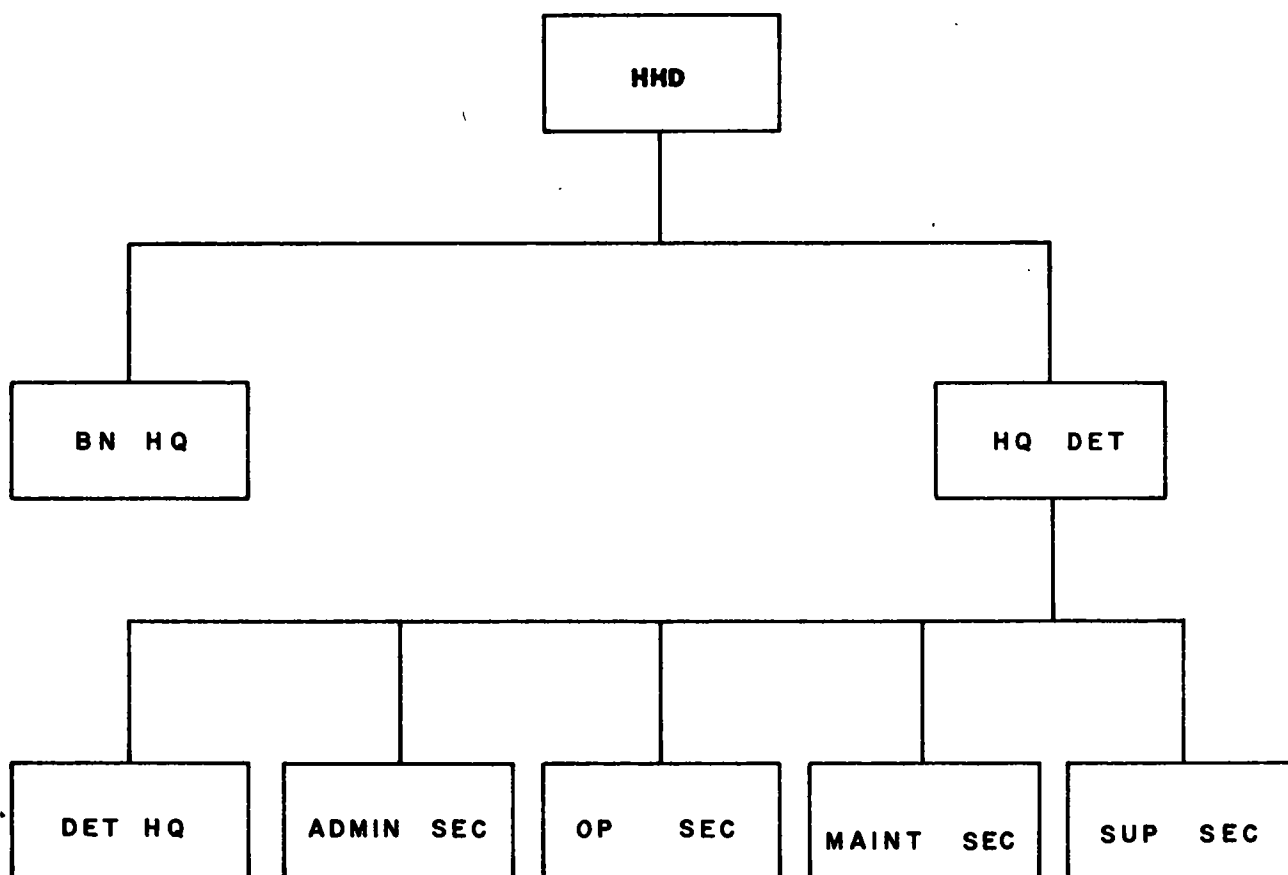


Figure 5-2. Headquarters and Headquarters Detachment.

map depot company; engineer base reproduction company; engineer base photomapping company; engineer base survey company and/or engineer topographic or intelligence teams.

(2) Organizational maintenance for its own vehicles and those of the map depot, reproduction, and photomapping companies. Additional maintenance personnel may be required if topographic or intelligence teams are attached.

(3) Procurement, compilation, reproduction, and distribution of military maps which, when combined with the efforts of all other topographic units, meet the requirements of a theater of operations.

(4) Military surveys of Class II, first order accuracy to produce a basic control net with an accuracy of 1/50,000 suitable for topographic and fire control.

(5) Assistance to the theater army G2 and the army engineer command in the preparation of terrain intelligence reports.

(6) Messing facilities for itself, the map depot, the reproduction, and the photomapping companies as well as any attached TOE 5-540 units.

(7) This organization operates one or more messes to support subordinate units other than the engineer base survey company. (The survey company has its own mess capability)

b. This unit is a Category III unit; when organized at levels 2 or 3 operational capabilities are reduced to 90 percent and 80 percent, respectively.

c. The scope of the mission in the theater of operations will determine the extent to which the base topographic battalion will be augmented by additional teams or units to accomplish an expanded mission. The battalion is a flexible organization. Its capabilities are determined by the type and number of topographic teams attached to it. These capabilities are described for each type of team in subsequent paragraphs. When special projects are assigned, special teams should be provided.

d. The battalion is equipped to function as a separate unit and is administratively self-sustaining. The equipment of the engineer base topographic battalion with its flexible topo-

graphic teams is sufficient to perform the normal mapping tasks of a theater headquarters. The battalion has equipment sufficient for administration, mess, supply, and organizational maintenance. Organic equipment of the engineer base topographic companies and teams includes surveying, compilation, reproduction, and map distribution equipment which is described under the respective organizations. Certain items of photomapping and reproduction equipment require stationary installation.

e. The battalion headquarters detachment installs and operates telephone switching facilities and provides telephone service to its companies. Theater signal units provide the battalion with access to trucking facilities in the communications zone. The zone of interior headquarters provides trunk service for the battalion.

f. Aircraft support is provided by augmentation with TOE 1-500 teams when required and authorized by appropriate commanders.

5-7. Command Operations

a. The base topographic battalion, under operational control of the theater army engineer, through the ENCOM, accomplishes topographic surveys, map compilation, reproduction and distribution activities in support of combat operations. Upon receipt of program information, the battalion commander, with the assistance of the battalion staff, makes a breakdown of the mapping requirements and coverage assigned to the battalion; checks the existing available map coverage to determine what is suitable for use and which require revision; determines the additional requirements for aerial cartographic photography and ground control; determines what map and mapping support should be furnished army topographic units; and, based on an analysis of the above, determines the additional topographic supplies and special and auxiliary equipment (including available indigenous equipment) that will be required to accomplish the battalion mapping mission.

b. The battalion commander directs his operations officer (S3) to submit the request for new photography to theater army headquarters through the theater army engineer or ENCOM

and prepare the battalion operations order delegating survey and mapping tasks, including the map distribution plan, to subordinate units of the battalion. He directs the supply officer (S4) to prepare the supply schedules and directs his executive officer to coordinate these activities.

c. The battalion commander furnishes the theater army engineer with progress reports containing information on maps and charts by type, in production during the reporting period; estimated dates of completion for maps and charts in progress; number of copies of each map or chart produced; and whether maps or charts are original editions, revisions, overprints or reprints.

5-8. Headquarters Detachment

Personnel of the battalion staff sections are provided by the headquarters detachment. These sections are the administrative, operations, maintenance, and supply sections.

5-9. Detachment Headquarters

Detachment headquarters is organized to provide its own administration and mess facilities for headquarters and headquarters detachment, the map depot company, the reproduction company, the photomapping company, elements of survey company not deployed, and attached TOE 5-540 teams.

5-10. Operations Section

The operations section provides the personnel and facilities to assist the operations officer (S3) in formulating the operations and intelligence missions and training programs of the battalion. This section is under the direct supervision of the operation officer (S3). This section can provide a limited distribution of topo-

graphic maps on an emergency basis to combat and combat support units.

5-11. Supply Section

The supply section is organized along conventional lines to provide personnel and equipment to accomplish all battalion general and topographic supply functions. This section is under the direct supervision of the unit supply technician warrant officer, who reports directly to the battalion supply officer (S4).

5-12. Maintenance Section

The maintenance section consists of a motor maintenance sergeant, generator operator/mechanic, wheeled vehicle repairmen, equipment reports clerk, and apprentice repairmen. It provides organizational maintenance for the map depot, reproduction, and photomapping companies.

5-13. Liaison with Photographic Organizations

Close liaison should be maintained between the mapping (the battalion) and aerial photographing agencies. The preparation of specifications and priorities for aerial cartographic photography required for mapping is a Corps of Engineer responsibility. Both the mapping and photographing agencies are partners in the mapping job and neither can perform its particular functions without close liaison and a knowledge of the problems of the other. Whenever aerial photographic organizations are assigned basic photographic missions designed to meet immediate or prospective mapping requirements, the engineer base topographic battalion commander responsible for the preparation of the maps must take the necessary steps to assign a competent engineer liaison officer to the photographic unit. This officer will command the photographic evaluation team.

Section III. ENGINEER BASE PHOTOMAPPING COMPANY, TOE 5-349

5-14. Mission

a. To provide combat support for a theater army by compiling and revising new and existing multicolor maps and map substitutes, and

by extending ground control for artillery and missile fire using photogrammetric means to produce a gridded graphic. To compile and produce reproducible material for engineer

intelligence and terrain studies and to evaluate aerial photography to determine its suitability for mapping purposes.

b. This company consists of a company headquarters and two identical photomapping platoons. The organization of the company is shown in figure 5-3.

5-15. Assignment

This company is assigned to a communications zone or zone of the interior. Normally, it is attached to headquarters and headquarters detachment, engineer base topographic battalion.

5-16. Mobility

Since it is designed for operation at a fixed installation, the company is only 9 percent mobile in organic transportation. It is 100 percent air transportable in medium transport aircraft.

5-17. Capabilities

a. At level 1 (full strength), this unit, on a two-shift basis, provides:

- (1) Evaluation of aerial photography to determine its suitability for mapping purposes.
- (2) Compilation of new maps from aerial photography using photogrammetric methods.

(3) Controlled mosaics of aerial photographs.

(4) Revision of topographic, planimetric and special maps.

(5) Color separation engraving or drafting as required.

(6) Extension of ground control for artillery and missile fire by photogrammetric means, to produce a gridded graphic.

(7) Base material for engineer intelligence and terrain studies.

(8) Organizational and direct support maintenance on photomapping equipment.

b. This unit is a category III unit (AR 320-5). It is dependent on the headquarters and headquarters detachment, engineer base topographic battalion, for messing and organizational maintenance of organic vehicles. TOE 29-500 teams provide this service for the company when it operates independently. When organized at levels 2 or 3, this unit's operational capabilities are reduced to 90 percent and 80 percent, respectively.

5-18. Company Headquarters

Company headquarters provides the command,

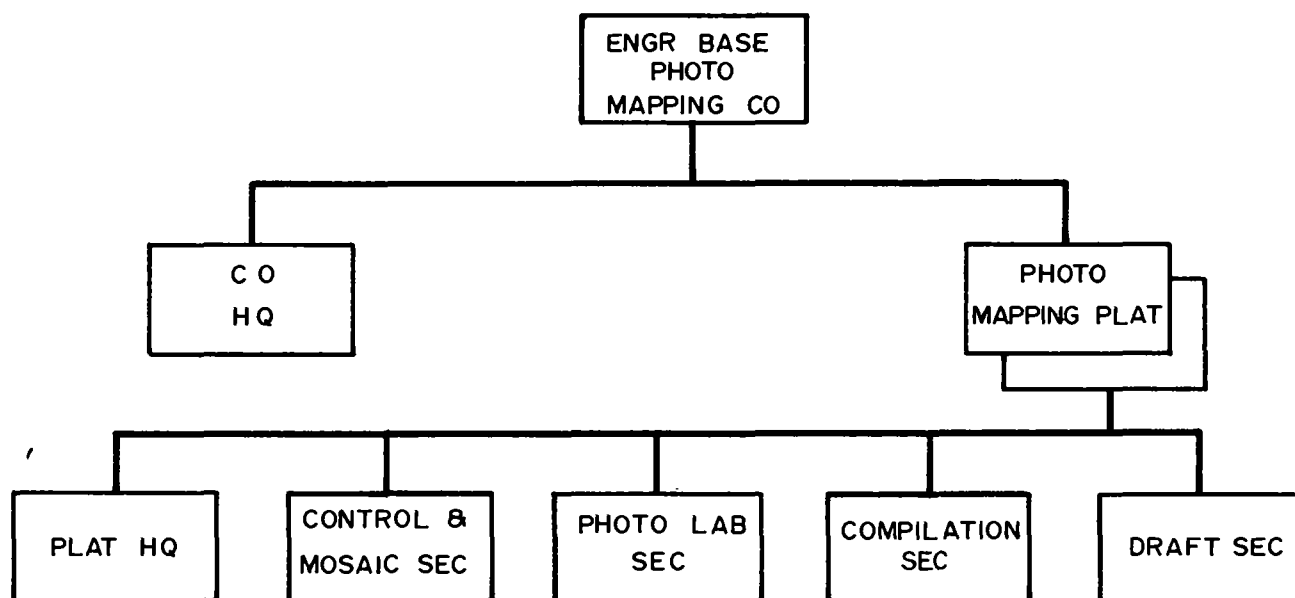


Figure 5-3. Engineer Base Photomapping Company.

administration, supply, utilities, and operational support for the two photomapping platoons. All of the equipment of the company, except the individual weapons of the personnel of the two platoons, is in company headquarters.

Section IV. ENGINEER BASE SURVEY COMPANY, TOE 5-348

5-20. Mission

The mission of this company is to accomplish plane or geodetic surveys as required and to make necessary computations to establish, recover, or adjust geodetic position control to a given control system for use in new mapping and/or map revision projects. This unit also provides position and azimuth control to other surveying elements of the army, and extends ground control to the rear boundary of army areas in support of surveying elements of the engineer topographic battalion, army. The organization of the company is shown in figure 5-4.

5-21. Assignment

This company is assigned or attached to head-

5-19. Photomapping Platoons

Each of the two photomapping platoons consists of a platoon headquarters, a control and mosaic section, a photo laboratory section, a compilation section, and a drafting section.

quarters and headquarters detachment, engineer base topographic battalion.

5-22. Mobility

The engineer base survey company is 100 percent mobile utilizing organic vehicles and 100 percent air transportable in medium transport aircraft.

5-23. Capabilities

a. At level 1 (full strength), this unit provides:

(1) Organic topographic, artillery and missile fire control surveying support to one or more field armies in a theater of operations, to a communications zone, or to the zone of interior.

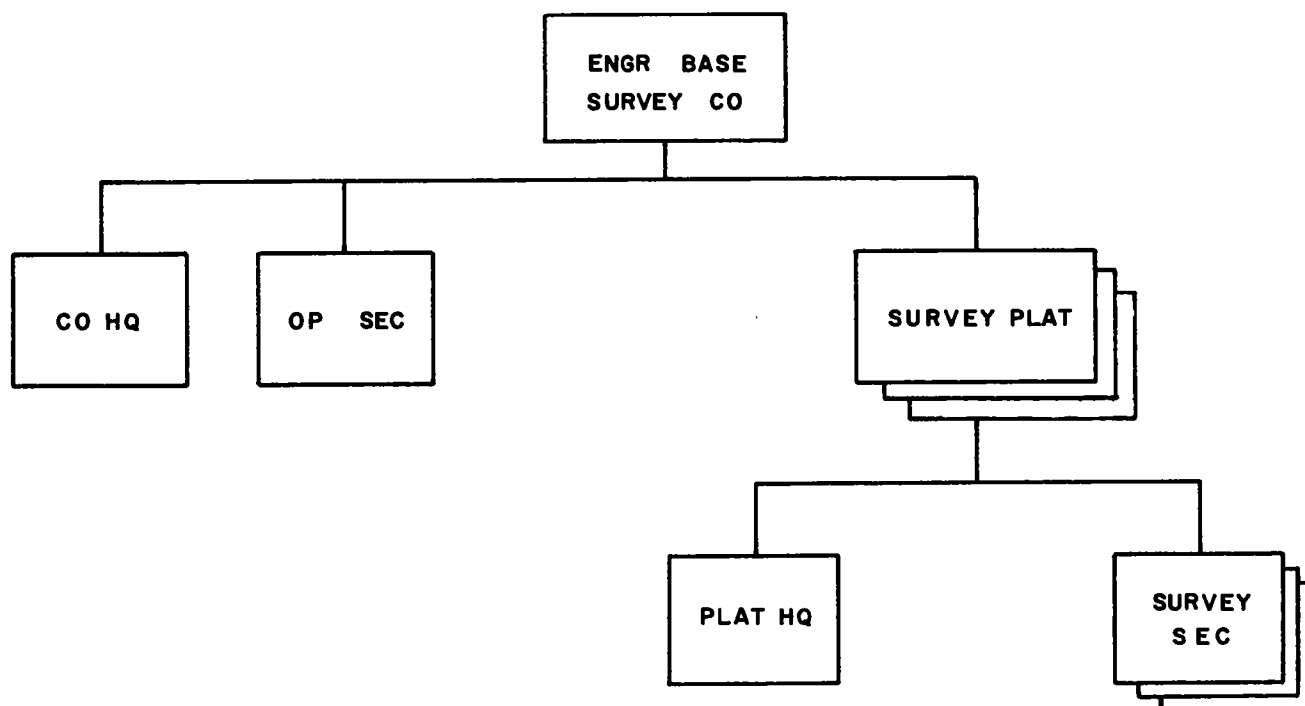


Figure 5-4. Engineer Base Survey Company.

(2) Geodetic survey of first, second and third order accuracy, including first order astronomic position determinations, second and third order leveling and the establishment of base lines.

(3) Topographic and artillery fire control surveys using conventional field methods.

(4) Geodetic control data to elements of the battalion and to army and corps for compilation of new maps or revision to existing topographic maps and for artillery and missile fire control survey by stereophotogrammetric methods.

(5) Any one of the following, per month, by each of the survey section, under ideal conditions.

(a) *Third order survey:*

1. Triangulation—using “Quads” as the basic figure—750 kilometers of progress.

2. Traverse—utilizing electronic survey instruments—600 kilometers of progress.

3. Leveling—160 kilometers of progress.

(b) *Second order survey:*

1. Triangulation—using the “Quad” as the basic figure—340 kilometers.

2. Traverse—rate of progress based on several variables; e.g., transportation provided to move the equipment, terrain, and weather.

3. Leveling—160 kilometers of progress.

(6) Final computations on all survey data assembled.

(7) Organizational maintenance on all organic vehicles and equipment and direct support maintenance on all organic surveying equipment.

b. This unit is a Category III unit (AR 320-5), capable of operating as a separate company. Units organized at levels 2 and 3 reduce operational capabilities to 90 percent or 80 percent, respectively.

5-24. Employment

a. This unit is manned and equipped to function as a separate organization and is administratively self-sustaining. It is, however, normally attached as an operating element of

an engineer base topographic battalion in a communications zone of a theater of operations or the zone of interior.

b. This company may be employed as a separate organization to perform specific survey missions.

5-25. Company Headquarters

The company headquarters contains the necessary personnel and facilities by which the company commander exercises command, control, and coordination and training activities of the unit. It provides the necessary messing facilities, administration, supply, organizational maintenance and direct support maintenance for surveying equipment. The company headquarters also provides specialized high order survey equipment to the survey platoons when required.

5-26. Operations Section

This section provides personnel and facilities to assist the company commander in planning the technical operations of the company to accomplish assigned survey missions. The section is under the direct supervision of the company executive officer. He is assisted by a Warrant Officer, survey technician. The operations section coordinates the survey activities of the survey platoons, makes the necessary computations, and controls the quality of the work. A topographic survey control sergeant, necessary draftsmen, and topographic computers have been provided to check out the computations and survey information prior to submitting to battalion headquarters. One general clerk has been provided to assist in the administrative workload of the section and to perform messenger service as required. The radiotelephone operator operates the section radio to maintain radio communications with the dispersed survey platoons employed away from the company area.

5-27. Survey Platoon Operations

a. The survey platoons perform the necessary plane and geodetic surveys and computations to establish, recover, or adjust geodetic ground control to a given system for use in new mapping and/or map revision. They

also provide position and azimuth control and extend ground control to the rear boundary of army areas in support of surveying elements of the engineer topographic battalion, army.

b. There are three survey platoons, each organized into a platoon headquarters and three survey sections.

c. Personnel of each of the three platoons are as follows:

(1) *Platoon headquarters.* Platoon chief (survey technician), survey supervisor, topographic computers, riggers, carpenter, and radio-telephone operator.

(2) *Survey sections.* Each survey section is composed of a section chief, topographic computers, topographic surveyors, topographic recorders, and rodmen-tapemen.

5-28. Aviation Requirements

Whenever aircraft are required and authorized in support of the topographic company, they are provided by appropriate teams of TOE 1-500.

5-29. Aircraft Employment

Aircraft employed by the battalion are used primarily to—

a. Provide lift for survey teams performing topographic or field classification surveys in areas inaccessible by road or when speed is essential.

b. Provide lift for rapid deployment and to speedily resupply survey sections operating in the field.

c. Perform preliminary aerial reconnaissance of assigned areas prior to actual ground survey by survey sections.

d. Furnish lift for special equipment, including electronic survey instruments, when required for the accomplishment of the survey mission.

e. Provide a means for the commander and other personnel to adequately supervise the survey operations.

5-30. Tactical Operations

The units normal tactical operations are limited to local security and fighting in self-defense. Individuals of this unit can engage in effective, coordinated defense of the unit's area. In an emergency, such as a breakthrough, the company as part of a local area defense force, may be used to fight as infantrymen (para 5-43 through 5-45).

Section V. ENGINEER BASE REPRODUCTION COMPANY, TOE 5-347

5-31. Mission

To reproduce maps, map substitutes, charts and related mapping materials such as map indexes, trig lists and gazetteers, and engineer terrain and other engineer intelligence material, as required in support of one or more field armies, theater army support command (TASCOM), or the zone of interior. The organization of the company is shown in figure 5-5.

5-32. Assignment

This company is assigned to a communications zone or the zone of interior. Normally it is attached to headquarters and headquarters detachment, engineer base topographic battalion.

5-33. Mobility

Since it is designed for operation at a fixed installation, the company is only 30 percent mobile in organic transportation. It is 100 per-

cent air transportable in medium transport aircraft.

5-34. Capabilities

a. At level 1 (full strength), this unit, on a two-shift basis, provides:

(1) Reproduction support to one or more field armies in a theater of operations, to a communications zone or to the zone of the interior.

(2) Reproduction in quantities, by offset lithography, monochrome and multicolor maps, photomaps, overlays, overprints, and/or other topographic and engineer intelligence materiel at the approximate rate of five million impressions per month (Two-shift operation).

(3) Organizational and direct support maintenance on organic photographic and reproduction equipment.

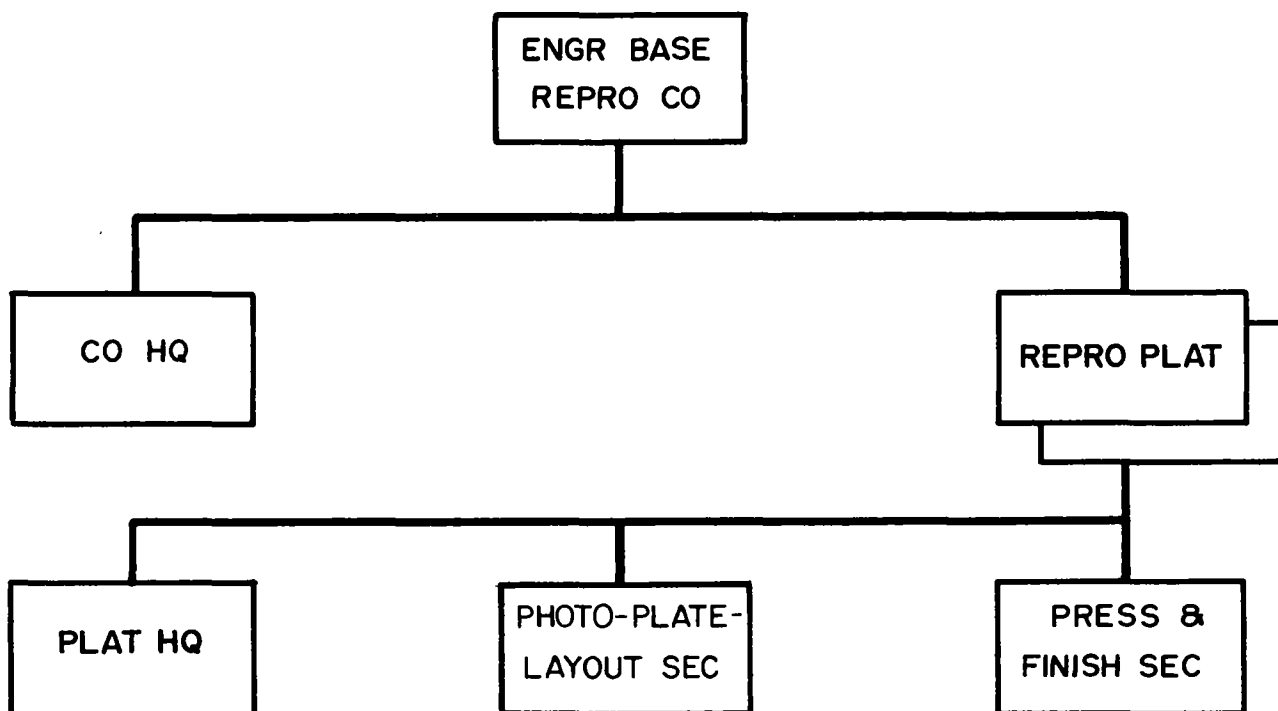


Figure 5-5. Engineer Base Reproduction Company.

b. This unit is a Category III unit (AR 320-5). It is dependent on Headquarters and Headquarters Detachment, Engineer Base Topographic Battalion, for messing and for organizational motor vehicle maintenance. TOE 29-500 teams provide this service for the company when it operates as an independent unit.

c. Units organized at levels 2 or 3 reduce operational capabilities to 90 percent and 80 percent, respectively.

5-35. Company Headquarters

The company headquarters provides the com-

mand, administration, supply, utilities and operational support for two reproduction platoons.

5-36. Reproduction Platoons

Two identical platoons provide the personnel to operate the reproduction equipment authorized in company headquarters. Each platoon is organized with a platoon headquarters, a photo-plate-layout section, and a press and finishing section. The reproduction equipment repairmen provide direct support maintenance of photographic and reproduction equipment.

Section VI. ENGINEER BASE MAP DEPOT COMPANY, TOE 5-344

5-37. Mission

This company provides for bulk receipt, storage, and distribution of maps, geodetic control data, gazetteers, aerial photographs, trigonometric list, and intelligence documents, and related topographic material. The organization of the company is shown in figure 5-6.

5-38. Assignment

This company is attached or assigned to headquarters and headquarters detachment, engineer base topographic battalion.

5-39. Mobility

This company is approximately 22 percent mo-

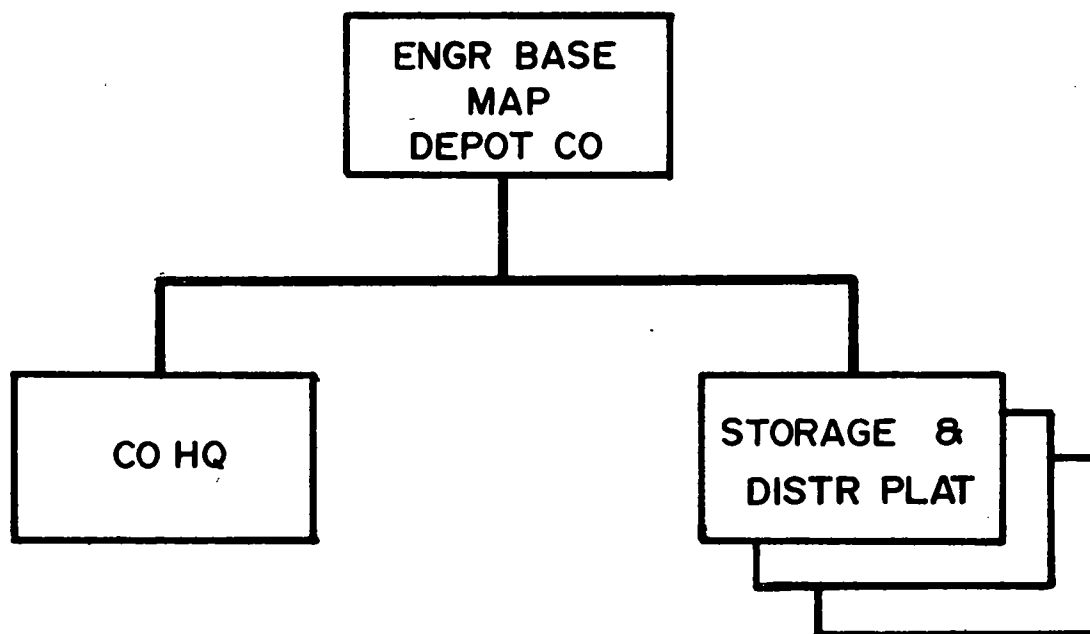


Figure 5-6. Engineer Base Map Depot Company.

able in organic transportation and 100 percent air transportable in medium transport aircraft.

5-40. Capabilities

a. At level 1 (full strength), this unit provides—

- (1) Map stockage for one army group.
- (2) Stocking an average of five million maps and handling 450,000 maps a day.
- (3) Receiving, classifying, and storing maps and mapping material.
- (4) Packaging and preparing maps and related intelligence materials for shipment to forward depots.
- (5) A forward map depot with a 150,000 map/day capability with each map storage platoon.

b. This unit is a Category III unit (AR 320-5). It is dependent on Headquarters and Headquarters Detachment, Engineer Base Topographic Battalion, for messing and for organizational motor vehicle maintenance. TOE 1-500 teams provide this service for the company when it operates as an independent company. Units organized at levels 2 or 3 reduce operational capabilities to 90 percent and 80 percent, respectively.

5-41. Company Headquarters

The company headquarters provides the command, administration, supply and coordination support for three storage and distribution platoons. When elements of the map depot company are operating away from the battalion, provisions for messing and maintenance must be made by attachment to a nearby unit or by attaching teams from the appropriate TOE 29-500 series teams.

5-42. Storage and Distribution Platoons

a. Three platoons provide personnel and equipment required for supervision and assistance in the receipt, storage and distribution of maps and related material, including requisitioning, stock accounting and inventory control activities.

b. Each platoon can operate and advance map depot capable of providing bulk map support of approximately 150,000 maps/day to a field army depot. The base depot capabilities will be reduced by the number of platoons assigned to operate advanced depots.

Section VII. REORGANIZATION FOR COMBAT

5-43. General

The engineer base topographic battalion and its component companies are responsible for their own local security and must be prepared to fight in self defense. Normally, the battalion headquarters and headquarters detachment, the photomapping company, and the reproduction company are at the same location or near enough to each other to engage in a united defense effort. However, while the company headquarters of the map depot company and the base survey company may be located near battalion headquarters, major elements of these companies normally operate at widely separated locations in the communications zone. As a result, these two companies will seldom func-

tion as a unit in combat. In an emergency, such as a breakthrough, personnel of the battalion and its companies may be called on to serve as infantry replacements in combat units.

5-44. Reorganization For Combat

Plans (SOP) for combat should be maintained by the battalion and its elements for those occasions when combat as a unit would be required. Such plans may be patterned after the reorganization for combat of the army topographic battalion shown in appendix C.

5-45. Defensive Measures

Paragraphs 6-38 through 6-41 discuss the defensive measures that should be employed against various types of attack.



CHAPTER 6

ENGINEER TOPOGRAPHIC BATTALION, ARMY

Section I. ORGANIZATION

6-1. Composition, TOE 5-305

The engineer topographic battalion, army, consists of a headquarters and headquarters company, one engineer map reproduction and distribution company, and one engineer photomapping company. The organization of the engineer topographic battalion is shown in figure 6-1.

6-2. Relation to Other Topographic Units

a. One engineer topographic battalion, army, normally is assigned to a field army.

b. The battalion functions under the operational control of the army combat engineer brigade. Battalion headquarters usually is located near army headquarters to provide for close liaison.

c. The battalion commander coordinates the planning and execution of mapping activities with the combat engineer brigade.

d. The battalion receives topographic support from the engineer base topographic battalion. The base battalion furnishes the army battalion basic material, such as trigonometric lists and map reproducibles, and carries horizontal and vertical survey control forward to the army battalions control point. The army battalion, in turn, furnishes basic mapping material and extends survey control forward for pickup by the corps topographic companies.

e. When not employed on its primary function of producing maps for use by the army, the battalion assists the base topographic battalion in the development of the theater mapping programs.

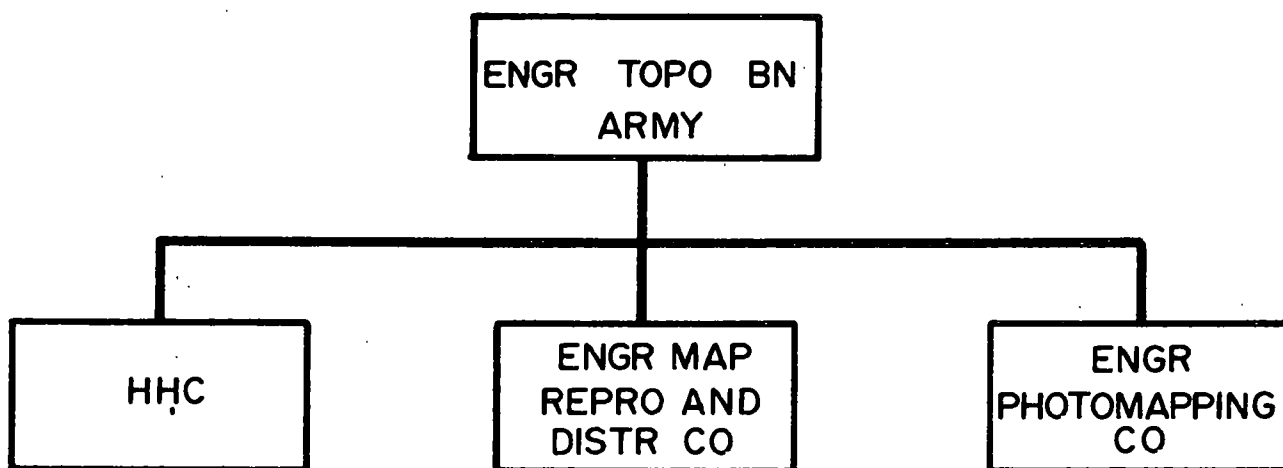


Figure 6-1. Engineer Topographic Battalion, Army.

Section II. BATTALION OPERATIONS

6-3. Battalion Headquarters

Battalion headquarters provides the command and advisory staff elements of the battalion and consists of the battalion commander, the executive officer, the adjutant (S1), the operations officer (S3), the supply officer (S4), the map reproduction officer, and the sergeant major. The operations officer performs additional duties as the intelligence officer (S2).

6-4. Mission

The mission of the engineer topographic battalion, army, is to provide engineer surveys, maps, map substitutes, and related technical information and materials as required for a field army. Individuals of this unit can fight as infantrymen when required. The unit has the capability of defending itself and its installations against hostile ground attack.

6-5. Capabilities

a. Battalion operations include the capabilities necessary to provide maps and engineer survey information as required for a field army. At Level 1 (full strength), this unit provides:

(1) Surveys and survey information required by a field army.

(2) Maps, photomaps, overlays, overprints and other intelligence material at the approximate rate of 3,500,000 impressions per month working two shifts per day.

(3) Storage and distribution of maps and related materials required by army troops.

(4) Maps, photomaps, map mosaics, sketches, drawings and related materials for use by an army in the field.

(5) Assistance in preparation of engineer terrain intelligence reports.

(6) Evaluation of aerial photography and operation of a geodetic survey information center.

(7) Organizational maintenance for organic vehicles and direct support maintenance of all organic topographic survey and reproduction equipment.

b. This unit is a Category II unit (AR

320-5); when organized at levels 2 or 3 operational capabilities are reduced to 90 percent and 80 percent, respectively. The battalion is approximately 85 percent mobile by organic transportation.

c. The battalion is equipped organically to function as a separate unit and is administratively self-sustaining. Equipment includes surveying, map compiling, and map reproduction equipment.

d. Army signal units provide the battalion with access to the army area communications system. The battalion headquarters installs and operates organic telephone switching facilities and provides telephone service to company headquarters. Companies provide messenger service to their platoons.

6-6. Command Operations

The battalion commander is responsible for the discipline, maintenance, supply, administration, tactical and technical efficiency, and combat readiness of the battalion. In addition, the battalion commander—

a. Locates his headquarters near army headquarters to provide for close coordination in the planning and execution of mapping activities for which the army commander, the G2, and the army engineer brigade are directly or indirectly responsible, and to facilitate liaison with the artillery commander and the G2 air.

b. Obtains all available mapping material, including existing maps, aerial photographs, and ground control from higher headquarters. With the assistance of the battalion staff, evaluates these data in terms of additional aerial photo coverage, ground control, and revision, and prepares plans for amplifying and improving existing map data.

c. The personnel and administrative section of battalion headquarters is divided into a general administrative subsection and a personnel subsection.

d. The personnel subsection, under the supervision of the military personnel warrant officer, operates a central personnel office, processes, and maintains all personnel records for the battalion.

6-7. Intelligence

a. The operations and intelligence section of the battalion is responsible for the production of engineer intelligence. Engineer intelligence is as much a product of the battalion as maps. It includes terrain studies, map intelligence, and survey information.

b. The operations officer (S3) performs additional duties as the engineer intelligence officer (S2). He is responsible to the battalion commander for the following intelligence activities:

- (1) Staffing for army survey information center.

- (2) Terrain studies and other engineer intelligence studies.

- (3) Collecting and filing map and survey source material.

c. The engineer intelligence officer may be assigned the following counterintelligence activities:

- (1) Supervising the camouflage activities of the battalion.

- (2) Checking the security of all operations of the battalion.

- (3) Exercising staff supervision over the headquarters and assigned or attached units on local security measures.

d. The operations and intelligence section staffs the army survey information center. The section interprets tactical and technical information, collects map and survey information, and prepares engineer intelligence reports.

6-8. Operations

a. The responsibilities of the operations officer (S3) include training and the planning and supervision of technical and tactical operations of the battalion.

b. During the mobilization period and at other times when the battalion is not engaged in mapping operation or planning, the operations officer and his section are primarily concerned with training activities.

c. During the map production planning stage, the battalion operations plans are prepared by the operations officer in coordination

with the other staff sections and under the direction of the executive officer. The operations officer's responsibilities during the planning stage include—

- (1) Evaluating available mapping data in coordination with the photomapping company and survey platoon leader.

- (2) Preparing mapping specifications.

- (3) Preparing specifications for aerial mapping photography.

- (4) Recommending the assignment of mapping tasks to units and technicians of the battalion.

- (5) Assisting the surveying platoon and corps topographic companies in the initial phases of establishing control for survey work.

- (6) Preparing forms for essential map production reports such as personnel, equipment, supply, progress, and completion reports.

- (7) Preparing work flow charts of the various phases of map production to insure coordinated mapping operations.

- (8) Planning troop movements to bivouac areas.

- (9) Preparing the battalion defense plan.

- (10) Preparing the standing operating procedure for routine operations.

- (11) Preparing battalion operation orders based on the above planning operations and information provided by the other staff sections.

d. During map production operations, the operations officer's responsibilities include—

- (1) Supervising the execution of battalion operation orders.

- (2) Designating general areas for unit bivouac and working areas.

- (3) Coordinating and supervising troop movements to bivouac areas.

- (4) Maintaining liaison with the army engineer brigade, G2 air, and the artillery.

- (5) Inspecting and coordinating the flow of map production through the various units of the battalion.

- (6) Providing technical inspections by the technical specialists of the operations and intelligence section to insure adherence to mapping specifications, compliance with higher headquarters directives, and use of sound map production practice.

(7) Making final edit of maps prepared by the battalion.

(8) Preparing the command report.

(9) Making plans for future mapping operations.

e. The operations and intelligence section consists primarily of specialists who assist the operations officer in his technical responsibilities of map production planning, control and coordination incident to survey control, topography, photolithography, and map editing. The map reproduction officer has the additional duties of training and troop information and education officer.

f. Upon receipt of the battalion mapping mission and based on the evaluation of available mapping data by the operations and intelligence section, the operations officer and his assistants break down the mission into new mapping, revision of existing mapping, and reprints.

g. New mapping involves the following steps:

(1) The operations and intelligence section checks new mapping requirements; sets up a time schedule for the various production phases in accordance with completion time specified by higher headquarters; and forwards copies of time schedule to other staff section and unit commanders. The operations and intelligence section assembles all available control data and sends copies to the survey platoon and the photomapping company. Instructions are issued to the survey company for such additional control as may be needed.

(2) The survey platoon completes the necessary horizontal and vertical control and computations and forwards these data to the operations and intelligence section.

(3) The operations and intelligence section checks the computations and forwards these control data to the photomapping company.

(4) The photomapping company's operations section prepares work schedules for the photomapping platoons for the necessary compilation and drafting. Upon completion of the work, it is forwarded to the operations and intelligence section.

(5) The operations and intelligence section edits the final map manuscripts and forwards them to the reproduction and distribution company for proof copies.

(6) The reproduction and distribution company headquarters sends the map manuscript to the reproduction platoon which prepares proof copies and forwards them to the operations and intelligence section.

(7) The operations and intelligence section checks the proof copies, has corrections made where necessary and, after final approval, forwards them to the reproduction and distribution company for reproduction and distribution.

(8) The reproduction and distribution company headquarters sends approved proof copy to the reproduction platoon which produces the required number of copies. The maps are then forwarded to the map distribution platoon for storage and distribution at the army map depot, copies being forwarded to the operations section for its permanent file.

h. Revision of existing maps generally does not require field survey support, and operations follow *g* (4) through (8) above.

i. Reprints require only reproduction and distribution. The operations and intelligence section checks the condition of the reproduces and edits copy of last printing prior to forwarding for reproduction.

j. Careful coordination of the production phases by the operations and intelligence section is necessary to see that delays do not develop. A balanced workload through all phases of production, from beginning manuscript through reproduction, is desired. The shifting of qualified personnel and adjustment of product specifications within allowable limits, should be considered when program objectives are not being met.

6-9. Supply

a. The supply officer is responsible for the following supply activities:

(1) Planning and directing procurement, storage, and issue of all supplies and equipment in the battalion.

(2) Supervising supply records in all units of the battalion.

(3) Exercising staff supervision over the maintenance section and, assisted by the maintenance section chief, coordinating the operations, dispatch and maintenance and repair of wheeled vehicle and equipment assigned to the battalion. Consulting with operations officer to determine allocations and priorities for transportation.

(4) Planning and supervising operation of utilities such as water supply and electric power.

(5) Maintaining close liaison with all supporting supply establishments.

(6) Supervising the evacuation of supplies and equipment, in coordination with the operations officer.

(7) Conducting continuous training of supply specialists both in the battalion supply section and in the supply elements of subordinate units.

b. The supply section requisitions, stores, and issues supplies and equipment required by the battalion, including local procurement and manufacture. The section also assists the supply officer in carrying out his supply and maintenance responsibilities by field inspections.

6-10. Maintenance

a. The maintenance section chief, under the guidance of the battalion supply officer, is the principal advisor on all matters pertaining to automotive and topographic and reproduction equipment maintenance.

b. Duties of the maintenance section chief include—

(1) Coordination of equipment and vehicle operations and repair activities.

(2) Inspection of preventive maintenance procedures, including the enforcement of safe driving practices.

(3) Conduct of inspections to determine condition and state of maintenance of vehicles and equipment.

(4) Coordination of convoy operations, including loading and unloading of vehicles and equipment off vessels and railroad cars.

(5) Maintenance of appropriate records and submission of required reports.

(6) Preparation of unit SOP pertaining to

motor pool operations and maintenance of topographic and reproduction equipment.

(7) Coordination with the supply officer to determine maintenance priorities, allotment of special equipment, and the adjustment of unit work loads.

c. The maintenance section, under the staff supervision of the battalion supply officer, is supervised directly by the motor officer. Enlisted personnel of the maintenance section consist of the motor sergeant, wheeled vehicle mechanics, reproduction equipment repairmen, instrument repairmen and electricians, and a power-generator operator. The maintenance section performs organizational maintenance on all wheeled vehicles and direct support maintenance of all organic topographic survey (electronic and optical), and reproduction equipment; and furnishes technical advice on equipment and maintenance problems to the other elements of the battalion.

d. Repair parts supply is an important part of maintenance. The battalion maintenance section chief works in close coordination with the supply section to maintain effective repair parts supply. Repair parts are normally obtained from the direct support maintenance companies of the field army support command (FASCOM).

e. Maintenance operating procedures for the battalion should be guided by the following essential maintenance factors:

(1) Every piece of equipment and every vehicle should have an assigned user, operator, or driver who performs daily and weekly servicing under supervision.

(2) Repairs are performed at the lowest level of maintenance consistent with the nature of the repair, authorized repair parts, tools, time available, skill of personnel, and the accessibility of the next higher maintenance level. For example, field survey work should not be delayed by sending an instrument for adjustment if a member of the unit is capable and authorized to make the adjustment.

(3) Each level of maintenance performs any of the overflow maintenance functions of lower levels when required by practical considerations.

(4) Shop areas should be located adjacent

to access roads. Hardstands and covered shop areas increase work output.

(5) An adequate maintenance library (TM and LO) should be maintained at each level for all items of organic equipment, including pertinent supply manuals.

(6) Maintenance SOP should be firmly enforced throughout the command.

6-11. Map Distribution

The battalion map reproduction officer, who is also an assistant S3, is the principal advisor to the battalion commander on all matters affecting the distribution of maps. In coordination

with the intelligence and mapping element of the army engineer brigade, he prepares the map distribution plan for the army map depot which is operated by the map distribution platoon of the engineer reproduction and map distribution company. At the direction of the battalion commander, the battalion map reproduction officer makes periodic inspections of the operation of the map distribution system of the army map depot, to include periodic checks on initial and replenishment allowances, stock levels, security measures, and delivery schedules. He also maintains liaison with base and corps map depots.

Section III. HEADQUARTERS AND HEADQUARTERS COMPANY, TOE 5-306

6-12. Mission

The mission of headquarters and headquarters company is to provide command and staff administration, and supply and maintenance support for an Engineer Topographic Battalion, Army, and to furnish engineer surveys, maps and map substitutes, and related technical information and materials required by a field army.

a. Battalion headquarters provides command and advisory staff elements of the battalion. For a discussion of battalion staff operations see paragraphs 6-3 through 6-11.

b. Company headquarters provides command, administration, mess, communications and supply for the company (fig. 6-2).

6-13. Assignment

Organic to the Engineer Topographic Battalion, Army.

6-14. Mobility

This unit is 100 percent mobile by organic transportation and 100 percent air transportable by medium transport aircraft.

6-15. Capabilities

a. At level 1 (full strength), this unit provides:

(1) Command for supervising administration, training and operations of the battalion.

(2) Surveys required for topographic mapping, carrying forward Class I, 2d Order, ground control and azimuth data in support of corps survey elements, and providing survey support as required for missiles, surveillance devices and conventional artillery.

(3) Planning and supervision of topographic and photomap compilation and reproduction, and map distribution.

(4) Trigonometric lists, map reproductions and other basic materials to the field army and to corps topographic units.

(5) Assistance to Army G2 and Engineer in the production of terrain and other engineer intelligence reports.

(6) Staff assistance to the battalion in preparation of requests for aerial photography. Photography received is evaluated to determine suitability for mapping purposes.

(7) A geodetic survey information center to collect, correlate, and disseminate survey information as required.

(8) Supply and organizational maintenance service for the battalion.

(9) Direct support maintenance for reproduction, electronic, and optical survey equipment.

(10) Limited survey tower support for the survey platoon.

b. This unit is a Category II unit (AR 320-5); when organized at levels 2 or 3 opera-

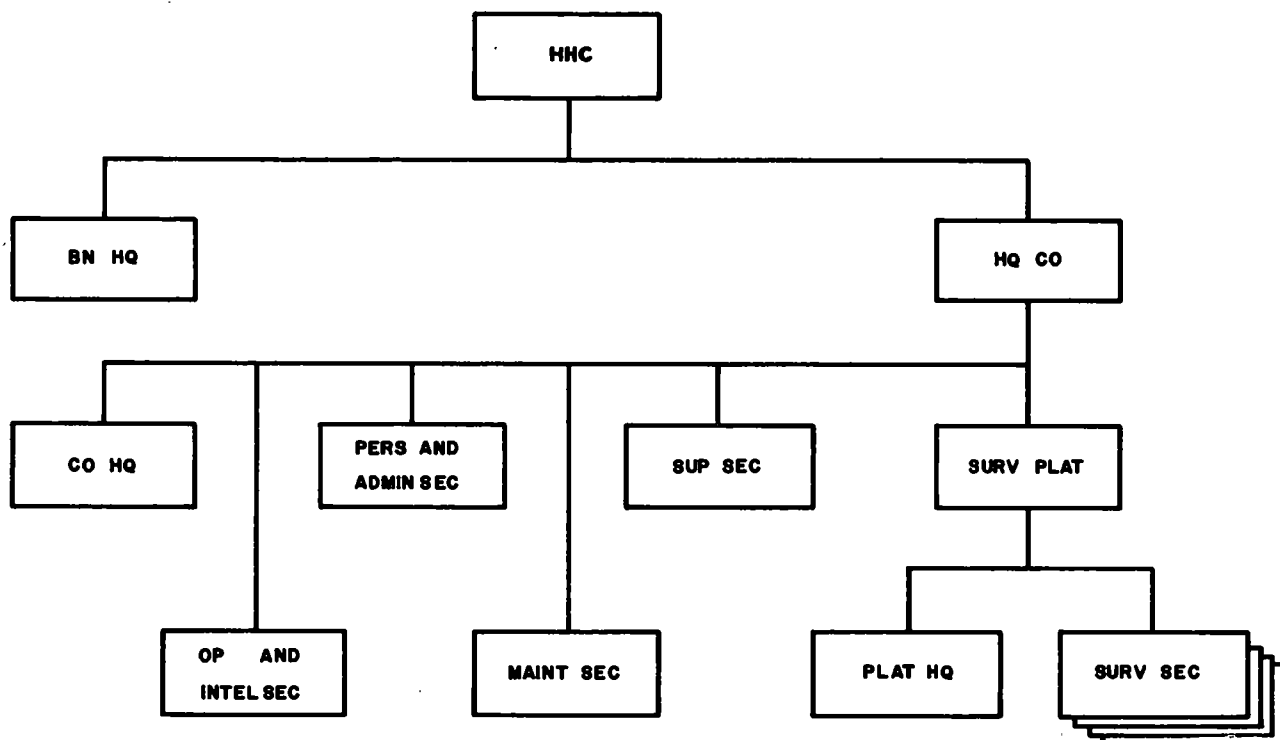


Figure 6-2. Headquarters and Headquarters Company, Engineer Topographic Battalion, Army.

tional capabilities are reduced to 90 percent and 80 percent, respectively.

6-16. Survey Platoon

a. The survey platoon has equipment to accomplish triangulation, trilateration, traverse, leveling, astronomic position and azimuth determination, and planetable surveys. In addition, it has sufficient computing machines for the computation and adjustment of field data. It conducts mapping surveys; establishes geodetic control for missile support, surveillance devices, and conventional artillery. The geodetic control is used by the topographic battalion, by the corps topographic company, and by artillery units.

b. The survey platoon consists of a platoon headquarters and four field survey sections. The survey sections are capable of performing second and third order survey required by field army. The surveys are accomplished with optical and electronic distance measuring equipment.

c. Personnel comprising the survey platoon are as follows:

(1) *Platoon headquarters.* Platoon leader, warrant officer-survey technician, surveyor supervisor, topographic computers, riggers, construction helper, radiotelephone operator and powerman.

(2) *Field parties.* Each of the four survey sections consists of a section chief, geodetic surveyors, topographic surveyors, topographic survey recorders, topographic computers, and rodmen-tapemen.

6-17. Survey Platoon Operations

a. The survey platoon leader is responsible to his company commander for the discipline, training, control, and the technical and tactical employment of his platoon. He should be thoroughly familiar with the employment and care of the equipment and materials. He should know the capabilities and personal characteristics of each man in his platoon. In the performance of his normal technical duties, the survey platoon leader—

(1) Analyzes the survey projects assigned his platoon and works out the job organization by subdividing the work into tasks that can be

accomplished by his headquarters and survey sections.

(2) Allocates necessary personnel and equipment support from platoon headquarters to the survey sections. Requests equipment support from company headquarters, when necessary, to supplement platoon equipment.

(3) Supervises the execution of platoon tasks to see that proper operational methods are followed, standards complied with, deadlines met, equipment properly employed and maintained, and topographic supplies economically utilized.

(4) Establishes proper safeguards for the work being performed by his platoon.

b. In addition to the normal command functions listed above, the survey platoon leader—

(1) Considers the time factor and his available equipment and men when selecting methods in prosecuting the assigned survey work.

(2) Arranges field survey work so that each phase of work will be a continuous part, adjacent to similar work previously completed or worked on by other parties. This will permit the battalion operation and intelligence section to provide provisional maps with the latest information prior to the completion of the battalion mapping program.

(3) Establishes priorities in laying out the field work so that the most essential field control is procured first and submitted by increments to the battalion operations section as it becomes available, for forwarding to the engineer photomapping company.

(4) Makes reconnaissance to select triangulation points, to locate sites for survey lines and towers, to clear lines of sight, to obtain permission to cross private property, and to locate bivouac sites.

(5) Makes decisions as to what method of survey will be utilized for extending horizontal control. These decisions will be based on time allotted, terrain, tactical situation, and economy of manpower.

(6) Arranges for necessary differential leveling.

(7) Sets up all control data as a permanent accessible record for future revisions.

(8) Develops well-trained survey parties

for triangulation, trilateration, traverse and level lines all well-versed in the selection, pricking and transferring of picture points.

(9) Train at least two plane table parties in the platoon to handle small jobs for which aerial photomapping is unavailable.

c. The survey technician warrant officer is responsible for the platoon's close technical direction, leaving the platoon leader free for supervision and planning. He supervises the maintenance of records, and progress reports and checks to see that deadlines are met. In the performance of his work, the survey technician warrant officer—

(1) Supervises and coordinates the work of the field parties and the computing personnel.

(2) Secures the astronomic data, the location of current group control, and other related matters from the battalion operations and intelligence section.

(3) Sees that office copies of field notes are accurate transcripts from original field notebooks and are submitted promptly as required by platoon headquarters.

(4) Insures that the computers make immediate computation and adjustment of horizontal and vertical control; checks the resultant data; has it compiled; and transmits the data to the battalion operations and intelligence section.

(5) Sees that all control points are properly established and identified so they may be readily found again.

(6) Insures that independent checks are made by members of the platoon at each step to avoid mistakes and eliminate unnecessary time-consuming work.

(7) Coordinates topographic control for the engineer topographic companies, corps, and the artillery.

d. The surveyor supervisor, the platoon sergeant, in addition to his administrative duties and responsibilities—

(1) Supervises and coordinates the field operations of the four field survey sections.

(2) Holds each member of a field party responsible for the proper use and safe return of his equipment; sees that breakage, damage, or loss is reported promptly, that equipment is ex-

amed when assigned and report made of any injury or deficiency found.

(3) Alternates members of each field party in the discharge of duties in order that on-the-job training may be continuous.

(4) Sees that field notes are properly kept, that they are complete and legible, that no erasures or alterations have been made, and that rejection of figures or pages are made by neat cancellations.

e. Survey section chiefs are responsible to the platoon leader for the control, training, and operational efficiency of their field parties. They should possess a detailed knowledge of the duties of all members of their parties and of the maintenance and operational procedures of work assigned their parties, including a detailed knowledge of the care and use of topographic equipment and supplies. They should also possess a knowledge of basic infantry tactics and the possible combat duties of the individual member of their parties.

(1) Each section chief has the general du-

ties of supervising his field party; maintaining discipline and harmony among the members of his party; determining procedures of survey work; assigning duties to individual members of his party; inspecting the work of the party for accuracy and neatness; keeping time and production records of the party; and arranging for on-the-job training of individual members of his party and of replacements.

(2) The section chief directs the work of his party and assists in the more difficult work.

6-18. Aviation Requirements

Aviation support may be required for survey operations for the reasons outlined in paragraph 5-29. When required and when authorized, aircraft are provided by appropriate teams of TOE 1-500.

6-19. Tactical Operations

Tactical operations of headquarters company are limited to local security of the company and battalion headquarters and fighting in self-defense with individual weapons.

Section IV. ENGINEER PHOTOMAPPING COMPANY, ARMY, TOE 5-308

6-20. Mission

The mission of this company is to compile and revise planimetric, topographic and special maps and map substitutes, and terrain and engineer intelligence material; to perform final evaluation of aerial photography to determine its suitability for mapping purposes; and to extend ground control by photogrammetry for artillery and missile fire control and for surveillance and other purposes in order to increase the combat effectiveness of the field army.

a. The engineer photomapping company, army, consists of a company headquarters, and two identical photomapping platoons. The organization of the engineer photomapping company, army, is shown in figure 6-3.

b. The company is 85 percent mobile with all its technical operations being conducted in expandable vans divided into six basic functions:

- (1) Copy and supply.
- (2) Photomapping.

(3) Cartographic.

(4) Multiplex.

(5) Rectifier.

(6) Map revision.

c. Each photomapping platoon is manned to operate the technical equipment in the multiplex, rectifier, cartographic and map revision van sections. The company headquarters is manned to supervise, control and support the two photomapping platoons. Additional transportation will be required to move personnel, equipment, and supplies required to support operations for approximately one month. Individuals of this organization can engage in effective coordinated defense of the unit's area or installation.

6-21. Assignment

Organic to the Engineer Topographic Battalion, Army.

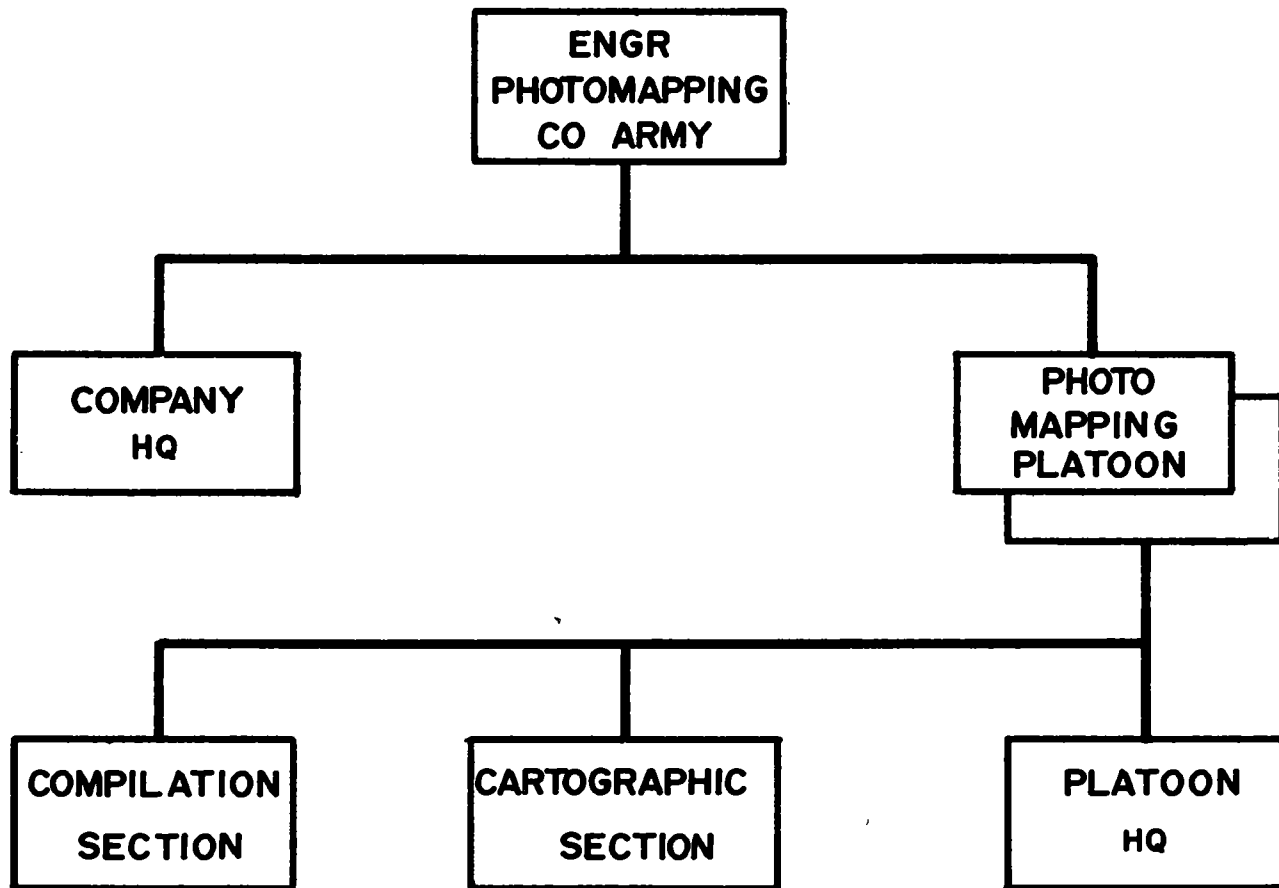


Figure 6-3. Engineer Photomapping Company, Army.

6-22. Capabilities

a. At level 1 (full strength) this unit provides:

(1) Compilation of controlled, semicontrolled and uncontrolled photomaps and mosaics.

(2) Compilation of a limited number of new maps from aerial photography, existing maps, charts and other sources, and a limited revision of existing maps.

(3) Special maps, overprints and overlays for army operations, and terrain and engineer intelligence studies.

(4) Final evaluation of aerial photography for mapping purposes.

(5) A sufficient number of ground point locations for mapping and fire control, through limited extensions of ground control by photo-

grammetric means from a strip or strips of aerial mapping photography.

(6) Organizational maintenance on photomapping and air conditioning equipment and wheeled vehicles.

b. This unit is a Category II unit (AR 320-5), when organized at levels 2 or 3 operational capabilities are reduced to 90 percent and 80 percent, respectively.

6-23. Mobility

This unit is 85 percent mobile with organic equipment and personnel. Additional transportation will be required to move personnel, equipment, and expendable supplies required to support operations for approximately one month. Organic transportation can move personnel, equipment, and paper stocks by making four additional trips with the cargo vehicles.

This unit is 100 percent air transportable in medium transport aircraft.

6-24. Company Headquarters

a. The company headquarters provides command, administrative, mess, supply, and maintenance support for the platoons of the company.

b. Personnel comprising the company headquarters are as follows:

(1) *Command element.* Company commander, company executive officer.

(2) *Administrative section.* First sergeant and company administrative clerk.

(3) *Mess section.* Mess steward, cooks and apprentice.

(4) *Motor section.* Motor sergeant, equipment reports clerk, powerman, wheeled vehicle repairman, and light truck driver.

(5) *Supply and maintenance section.* Supply sergeant, supply specialist, topo instrument repairman, and armorer.

(6) *Operations section.* Photomapping officer, cartographic control sergeant, topographic computers, process photographer, photomapping clerk.

c. Company headquarters, besides its normal housekeeping equipment, has tools for organizational maintenance, a carpenter set for improvement of local facilities, electric lighting equipment, and photomapping and reproduction equipment for use by the photomapping platoons. Each platoon is equipped with van-type trucks for mobile map compilation and drafting areas.

6-25. Operations Section

a. Technical operations of the company are planned, supervised, and controlled by the personnel of the operations section under the direction of the company commander and the photomapping officer. This includes the edit of products prepared by the platoons of the company.

b. In addition to the photomapping officer, personnel comprising the operations section are the cartographic control sergeant, topographic computers, process photographer, and a photomapping clerk.

c. The photomapping officer, in charge of the operations section, prepares technical instructions, specifications, and work schedules for the approval of the company commander. After approval, he forwards them to the platoon headquarters of the photomapping platoons for action.

d. Upon receipt of the control data from the survey platoon of headquarters and headquarters company, the cartographic control sergeant and the topographic computers of the operations section make the computations for the grid coordinates of the projection and other ground control. From these computations, they prepare working diagrams which are forwarded to platoon headquarters of the photomapping platoons for the preparation of control sheets and control boards by the drafting sections of these platoons.

e. The photomapping officer, assisted by the cartographic control sergeant and photomapping clerk, maintains production records and progress reports. He reviews these reports and checks to see that deadlines are met.

f. The operations section also maintains a photo and map source material library.

g. Upon receipt of the final drafted map manuscript and mosaics from the photomapping platoons, the cartographic control sergeant of the operations section, assisted by the topographic computers, makes the final company edit and forwards them to battalion headquarters for final edit and forwarding to the engineer map reproduction and distribution company, army, where the negatives and plates are made. If time permits, press proofs are returned to the operations section for final edit and any changes that may be required.

6-26. Photomapping Platoons

a. The photomapping platoons revise existing maps, construct photomaps, make map overlays and map substitutes, and prepare overprints for special purpose maps. The platoons are concerned primarily with the revision of large-scale topographic maps required by the army and the production of planimetric maps.

b. Each of the two identical platoons consists

of a platoon headquarters, a compilation section, and a cartographic section.

c. Personnel comprising each platoon are as follows:

(1) *Platoon headquarters.* Photomapping technician (Warrant Officer), Platoon sergeant, and assistant map compiler.

(2) *Compilation section.* Map compiling foreman, map compilers, multiplex map compilers, a process laboratory specialist and assistants.

(3) *Cartographic section.* Cartographic draftsman foreman and cartographic draftsmen.

6-27. Photomapping Platoon Operations

a. The platoon chief (photomapping technician), assisted by the platoon sergeant, plans, directs, and supervises the work of the photomapping platoons. In addition, the platoon leader concentrates on the operating efficiency of his personnel. He supervises test prescribed by the company commander for platoon personnel, eliminating personnel lacking visual acuity and manual dexterity for operation of the stereoscopic plotting instruments. After deficiencies are noted, he arranges with the company commander for replacements by transfer to other units, both for the benefit of the individual and the platoon. To insure the maximum utilization of all photogrammetric equipment when the topographic plotting stage has been reached, the platoon chief programs constant training of understudies and makes certain that particular care is employed in selecting those to be developed for this work.

b. The platoon sergeant—

(1) Makes the assignments, in accordance with the platoon chief's decisions, of the production phases to the compilation and drafting sections.

(2) Obtains the aerial photographs required for the project from the battalion operations and intelligence section; checks and forwards them to the compilation section, obtains such additional photos as may be required.

(3) Receives the control data from the survey platoon; checks and forwards data to the compilation section.

(4) Receives the mosaic boards and map compilation sheets from the compilation section; checks and forwards them to company operations section for edit; upon return, forwards them to the drafting section.

(5) Receives final drawings from the drafting section; edits and forwards them to company operations section for company edit.

(6) Maintains production records and progress reports so as to keep the platoon leader informed of production progress and completion dates.

c. The section chief of the compilation section, upon receipt of the control data and aerial photographs from platoon headquarters, organizes the mapping project for the mosaic laying and compilation personnel.

(1) He assigns some of his map compilers to the task of constructing semicontrolled mosaics.

(2) He divides the remaining map compilers and helpers into squads, each in charge of a senior map compiler, and assigns them the task of making compilations of maps from aerial photographs on control sheets.

(3) The section chief checks the working diagrams prepared by the topographic computers, the mosaic boards and map compilation sheets prepared by his section, and forwards them to platoon headquarters for edit.

d. The section chief of the cartographic section, upon receipt of the working diagrams, mosaics, and map compilation sheets, assigns tasks to squad chiefs.

(1) He divides the cartographic draftsmen into squads, placing a senior cartographic draftsman in charge of each squad. He assigns squad tasks of preparing the control sheets and boards from the working diagrams; placing the grids and marginal data on the mosaics; verifying the accuracy and adequacy of the map compilation sheets; and drafting the map manuscript.

(2) The section chief checks the finished drawings and forwards them to company headquarters for edit.

6-28. Tactical Operations

The company should be prepared to defend it-

self, or, together with the other units of the battalion engage in a common defense of the battalion installations. In an emergency such as

a breakthrough, the company, as part of the battalion, may be used to fight as infantrymen when required (para 6-39).

Section V. ENGINEER MAP REPRODUCTION AND DISTRIBUTION COMPANY, ARMY, TOE 5-307

6-29. Mission

The mission of this company is to reproduce, store, and distribute new and existing maps, map substitutes, photomaps, overlays, and other engineer and terrain intelligence material.

a. The engineer map reproduction and distribution company, army, consists of a company headquarters, a reproduction platoon, and a map distribution platoon that operates the army map depot.

b. The company headquarters provides command, administrative, mess, supply, maintenance, and utilities support for the platoons of the company.

c. Company headquarters consists of the

company commander, executive officer, first sergeant, and the personnel necessary to perform the headquarters support functions. The organization of the company is shown in figure 6-4.

6-30. Assignment

Organic to the Engineer Topographic Battalion, Army.

6-31. Mobility

This company is 80 percent mobile with organic transportation. Additional transportation support is required to move personnel and a daily operational requirement of paper stock.

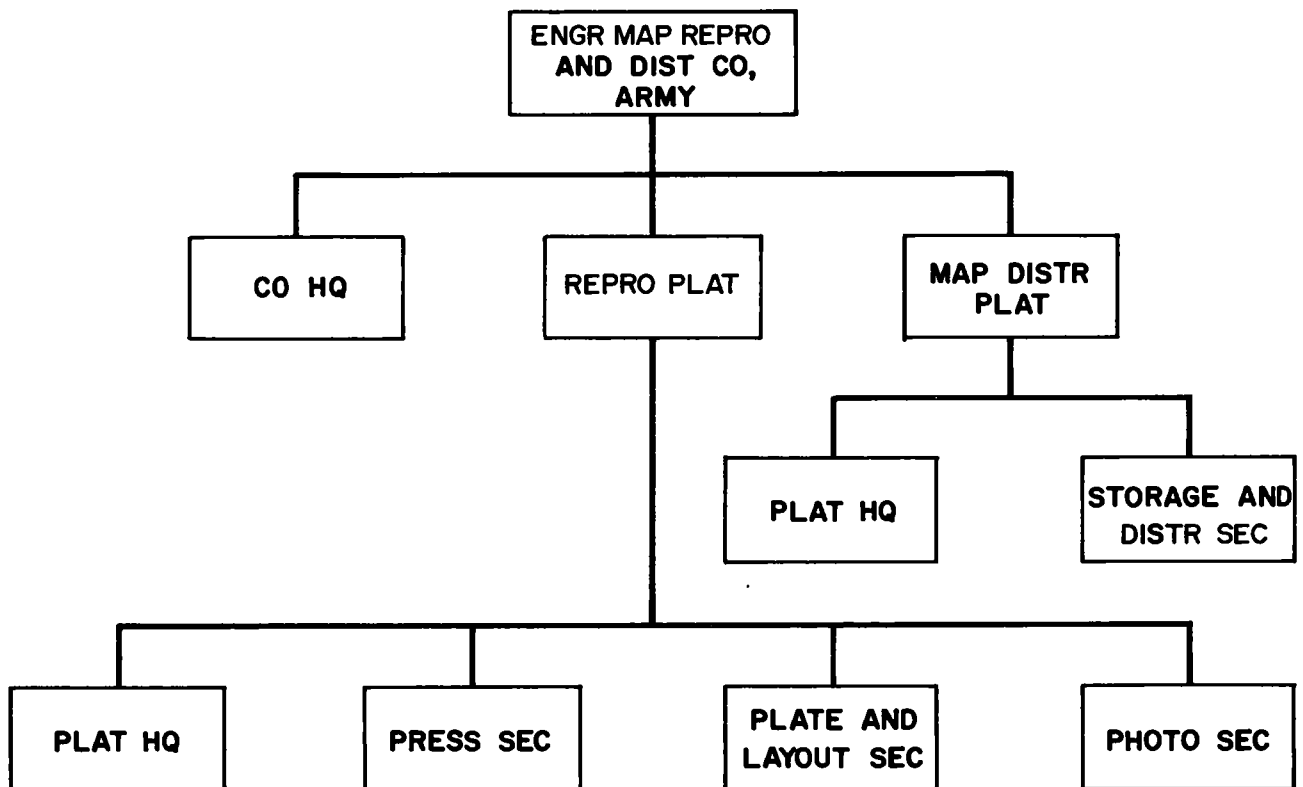


Figure 6-4. Engineer Map Reproduction and Distribution Company, Army.

Depot stockage of up to 600 tons of maps will require nonorganic transportation to move stocks. The company is 100 percent air transportable in medium transport aircraft. The map reproduction equipment of the company is mounted in van-type trucks divided into six basic functions:

- (1) Camera.
- (2) Laboratory (and Op Hq).
- (3) Map layout.
- (4) Photomechanical.
- (5) Plate process.
- (6) Offset press.

6-32. Capabilities

a. At level 1 (full strength), the unit provides:

(1) Reproduction in quantity by offset lithography, monochrome and multicolor maps, map substitutes, photomaps, overlays, overprints, and other engineer intelligence and terrain intelligence materials at the approximate rate of 3,500,000 impressions per month, working two shifts per day.

(2) Storing and distributing stocks of maps and material described above as required by army and corps units, including requirements of other services.

(3) Direct support maintenance of reproduction equipment.

b. This unit is a Category II unit (AR 320-5), when organized at levels 2 or 3 operational capabilities are reduced to 90 percent and 80 percent, respectively.

c. Besides its normal housekeeping equipment, company headquarters has tool sets for organizational maintenance; electrician and pipefitting sets for improvement of local facilities. The reproduction platoon is equipped with trailer-mounted generators which provide electric power for lights and operation of van-mounted equipment. These mobile reproduction units consist of a camera, a laboratory (and Op Hq), a photomechanical, a map layout, and a plate process section, and four press sections. The map distribution platoon has map distribution equipment, and trucks and trailers sufficient for normal map storage requirements.

6-33. Company Headquarters

a. The company headquarters provides command, administrative, mess, supply, and maintenance support for the reproduction and map storage and distribution platoons of the company.

b. The company commander—

(1) Selects the company area (after battalion operations officer designates the general area) with due regard to water supply, power, prevailing winds (dust and sand), and drainage.

(2) Locates company headquarters and the individual mobile vans to provide an efficient working organization.

(3) Checks with the reproduction platoon technician on the quality and availability of the water supply and modifies operation procedure accordingly.

(4) Checks the leveling of the mobile vans and determines that equipment is properly prepared for operation.

(5) Checks with the platoon leader of the map distribution platoon and determines the location for the army map depot with regard to security, storage facilities, and ease of access.

(6) Confers with the battalion operations and intelligence officer with reference to the map distribution plan.

(7) Supervises and coordinates the technical operations of the company, including all the necessary operations to reproduce, receive, store, and distribute maps and related material.

6-34. Reproduction Platoon

a. The reproduction platoon prepares process-photography negatives and photolithographic plates for maps and other intelligence material. The platoon reproduces this material on offset lithographic presses.

b. The reproduction platoon consists of a platoon headquarters, a photographic section, a plate and layout section, and a press section.

(1) Platoon headquarters contains personnel and equipment for supervision of the reproduction operation, and operation and maintenance of the power generation equipment.

(2) The photographic section makes copy

negatives and/or positives for offset printing and other reproductions.

(3) The plate and layout section in support of the battalion operations prepares negative/positive layouts of offset press plates required for proof or final map runs, and for images on scribe materials and other products as required.

(4) The press section prints maps, photomaps, overlays, overprints and other material.

c. Personnel comprising the reproduction platoons are as follows:

(1) *Platoon headquarters.* Map reproduction technician (warrant officer), photolithographic supervisor, photolithographic foreman, powerman, reproduction equipment repairman, and bindery specialist (power cutter operator).

(2) *Photographic section.* Photolithographic foreman, senior process photographers, photographers, and apprentice.

(3) *Plate and layout section.* Platemaker foreman, senior platemakers, platemakers and apprentice.

(4) *Press section.* Offset press supervisor, offset press foreman, offset pressman, and apprentice.

6-35. Reproduction Platoon Operations

a. The platoon chief—

(1) Makes a careful layout study of his mobile photographic, plate and layout, and press units to provide for efficient working operations.

(2) Has tests made of the available water supply, particularly in the preparation of solutions and the thoroughness with which washing the plates and negatives can be carried out; checks fogging, scumming, and precipitation of chemicals out of photographic developer solutions.

(3) Modifies procedures as required by the situation.

(4) Checks the positioning and leveling of the mobile units, and the electrical, water supply, drainage, and communication line attachments.

(5) Sees that the equipment is prepared for operation; that equipment is lubricated, utensils are clean, and solutions mixed.

(6) Sees that tests are made where necessary to determine the exposure or development time.

(7) Sees that photographic and lithographic supplies and repair parts are on hand in sufficient quantity to perform the assigned reproduction mission.

(8) Supervises and coordinates the work of the platoon, keeping a close check on its progress and completion dates.

6-36. Map Distribution Platoon

a. The map distribution platoon receives, stores, and distributes maps and related material required by army troops and corps. The platoon operates the army map depot.

b. The map distribution platoon consists of map distribution, supply, and storage specialists, packing-case makers, and warehousemen.

c. The platoon consists of a platoon headquarters and a storage and distribution section organized as follows:

(1) *Platoon headquarters.* Platoon headquarters consists of the platoon leader, platoon sergeant, supply specialists, supply clerks, and a packing and crating specialist.

(2) *Storage and distribution section.* The section consists of the warehouse foreman, supply specialist, packing and crating specialists, warehousemen, and supply and shipping clerks.

6-37. Map Distribution Platoon Operations

a. The map distribution platoon operates the army map depot which should be located in the army service area. Sufficient protected dry space should be provided for the storage of the map stocks, which consist of strategic and tactical maps, photomaps, road maps, negatives of reproduction materials, gazetteers, trig lists, engineer geographic intelligence products.

b. The platoon leader, assisted by the platoon sergeant—

(1) Locates and lays out the arrangements for the army map depot. The layout provides for receipt, handling, storage, shipping, and accounting space. Whenever possible the layout should provide receipts at one end and shipping at the other, so that both operations may be carried on concurrently without obstructing each other.

(2) Supervises and coordinates the receipt and storage of bulk map stocks produced by the company and received from the base map depot and the distribution of bulk map stocks to the corps map depot, and issue to army troop units.

(3) Supervises the map accounting records.

(4) Sets up regulations for carrying out the security policies of the army map supply plan, such as, armed guards for map delivery vehicles, special pass system to and from the depot, double-check systems on counting and coding shipments, and destruction of waste stocks.

c. The warehouse foreman, assisted by the supply and shipping clerks, packing and crating specialists, and warehousemen—

(1) Receives the bulk shipments of maps, checking receipts against shipping tickets and requisitions.

(2) Handles the receipts by moving stock on order to shipping for processing and forwarding, and moving stock for replenishment to storage.

(3) Establishes a system of storage that permits quick location of any map required for distribution.

(4) Maintains map accounting records, such as stock levels, inventory control, sheet locations, allowances, and job record files.

(5) Is responsible for the proper observation of security measures, especially with reference to the storage and issue of classified maps and trig lists.

d. The senior supply specialist, assisted by the supply specialists and warehouse personnel, breaks down and schedules the delivery of bulk map shipments by counting, packaging, addressing, and shipping to army units and corps distribution points.

Section VI. TACTICAL OPERATIONS

6-38. General

The engineer topographic battalion, army, is responsible for its own local security and should be prepared to fight in self-defense. The battalion, normally located near army headquarters, usually becomes a part of the emergency defense plan within the headquarters area.

6-39. Reorganization for Combat

The purpose of reorganizing the battalion for combat is to prepare the battalion for defense of its bivouac and working areas against enemy attack, or to assist in defense of the army headquarters area.

a. An SOP for reorganizing the battalion for combat is outlined in appendix C.

b. The battalion is reorganized into two echelons—combat or forward echelon, and security or rear echelon. The combat echelon consists of a battalion headquarters and three rifle companies:

The security echelon of administration and maintenance personnel not included in the combat echelon.

c. Battalion headquarters includes, com-

mand, administration, communications, operations-intelligence, and ammunition sections.

d. The photomapping and map reproduction and distribution companies, less their rear echelons, are organized as rifle companies. Each company consists of a company headquarters and two rifle platoons. Each platoon consists of a platoon headquarters, and three rifle squads. Headquarters company, less the personnel required for battalion headquarters and those in the rear echelon, is similarly organized. Radios from headquarters and headquarters company are distributed among the three companies to achieve a balanced radio communication capability.

e. The battalion security detachment consists of administrative and maintenance personnel not included in the combat echelon. The security detachment is responsible for local security of bivouacs and working areas, fire fighting, damage control, preparation and distribution of hot meals, and preparation of equipment for evacuation in the event bivouacs and working areas become untenable. The battalion map reproduction, supply, and motor officers are normally assigned to the security echelon.

f. Battalion headquarters provides telephone nets to company command posts. Companies provide messenger service to their platoons.

g. Rations and water are furnished elements of the combat element by the security detachment. Mess sections furnish hot meals when the situation permits; otherwise combat-type rations are issued. Ammunition supply is controlled by the ammunition section of battalion headquarters. The battalion supply warrant officer, assisted by four supply specialists makes up this section. Transportation and personnel for loading ammunition are furnished by the security echelon and are under the direction of the battalion supply officer. Movement of ammunition, controlled by the battalion supply section, should be direct from rear ammunition dumps to company distributing points. Other supplies, as needed by combat echelons, are sent forward by the battalion supply officer from security echelon areas.

h. The army medical unit providing medical service to the battalion provides a battalion surgeon and medical detachment. The battalion surgeon sets up the battalion aid station near battalion headquarters; supervises the operations of the medical detachment; and furnishes one aid man to each company. Litter bearers are drawn from company personnel as required.

i. The reorganization plan usually becomes effective upon receipt of alert from army headquarters or the defense area headquarters. On alert, all topographic work ceases. Engineer equipment is evacuated to equipment parks designated by the commander of the security echelon. Full field equipment is retained by individuals. All other individual equipment should be loaded by the company security echelon and stored in areas designated by the battalion supply officer.

j. The reorganization for combat plan should be tested during all combat training exercises.

6-40. Defense Against Air Attack

Defensive measures by the battalion consist principally of developing a passive and active air defense.

a. Passive air defense is directed toward the protection of personnel and equipment by

training personnel in aircraft recognition; digging prone emplacements for personnel near working areas and bivouacs; dispersing vehicles and equipment; concealing bivouacs and working areas; providing an effective warning system; and camouflage.

b. Active air defense is limited to engaging hostile aircraft with small arms fire. Large volumes of fire from nonair defense weapons have proven capable of destroying both high and low speed aircraft or disrupting their attack. Use of unit weapons in this role must be balanced against the requirement to prevent disclosure of positions.

c. *Rules for Engagement.* In the absence of orders to the contrary, individual weapon operators will engage attacking aircraft; engagement of all other hostile aircraft will be on orders issued through the unit chain of command and will be supervised by unit leaders. Nothing in these rules is to be taken as requiring actions prejudicial to accomplishment of the primary mission of the unit.

d. *Techniques.* The following techniques should maximize the destructive and/or deterrent effect against aircraft. Aircraft may be divided into two categories—low speed and high speed. Low speed aircraft include helicopters and liaison, reconnaissance, and observation fixed wing propeller aircraft. High speed aircraft include all other propeller aircraft and all jet fixed wing aircraft. This distinction will result in simplified engagement procedures.

(1) *Engagement of low speed aircraft.* In accordance with the rule for engagement, engage low speed enemy aircraft with aimed fire, employing the maximum weapon rate of fire. Aerial gunnery techniques generally applicable to all small arms and automatic weapons are presented in FM 23-65.

(2) *Engagement of high speed aircraft.* In accordance with the rule for engagement, engage high speed enemy aircraft with maximum fire aimed well in front of the aircraft, and above its flightpath, in order to force it to fly through a pattern of fire. This technique is not unaimed "barrage" fire, but requires a degree of aimed fire. It does not, however, call for careful estimation of aircraft speed and required lead.

(3) *Use of tracer ammunition.* This type of cartridge is intended for use with other types to show the gunner, by its trace, the path of the bullets, thus assisting in correcting aim. Individual weapons should utilize the highest practical proportion of tracer ammunition for this purpose and to enhance the deterrent or disruptive effect. Tracer ammunition will also reveal friendly positions to the enemy. Limited use of tracer ammunition should be considered if engagement is desired without totally fixing friendly positions.

(4) *Massed fire.* Units should employ a massed fire technique when using small arms weapons in an air defense role.

e. Standing Operating Procedures. Battalion and company SOP should cover, but not be limited to, the following items relevant to engagement of aircraft with nonair defense weapons:

(1) *Applicability.* (Operators of designated weapons.)

(2) *Relation to primary mission.* (Primary mission is never prejudiced.)

(3) *Relation to passive air defense.* (The necessity for aggressively engaging hostile aircraft is balanced with the requirement to place in proper perspective the tactic of withholding fire to preclude disclosure of position.)

(4) *Authority to engage.* (Authority to engage attacking aircraft is delegated to individual weapons operators and to engage all other hostile aircraft on order through unit chain of command, subject to the rules for engagement.)

(5) *Rules for engagement.* (Normally self-defense only against all attacking aircraft and those positively identified enemy aircraft which pose a threat to the unit.)

(6) *Rules for withholding fire.* (When ordered. When not positive that aircraft are actually attacking or otherwise hostile. When friendly aircraft or troops are endangered.)

(7) *Firing techniques.* (Lead and super-elevation. Massed fire. Maximum rate of fire. Maximum use of tracer ammunition.)

(8) *Unit training requirements.* (Motivation and discipline. Gunnery. Aircraft recognition.)

6-41. Defense Against Chemical and Biological Agent Attack

a. Defensive measures by the battalion consist of providing CBR protective shelters as deemed necessary by the battalion commander; providing a warning system; training in use of protective equipment; damage control (particularly prompt firefighting in case of incendiary attack); and decontamination of personnel, equipment, and necessary areas.

b. During a chemical agent attack, the most important action is the enforcement of CBR discipline requiring battalion personnel to make full use of protective equipment and facilities. Prompt firefighting is required in case of incendiary attack.

c. After the attack, personnel should continue first aid procedures, such as giving additional atropine for nerve agent symptoms, protective ointment for neutralizing liquid agents, the M13 kit for removing liquid agents. They should also perform any additional personal decontamination. The battalion aid station renders first aid to affected personnel, and selected squads detect and mark contaminated areas. Other squads decontaminate areas, installations, and equipment necessary to reconstruct installations and defensive work and to continue the battalion's mission. See FM 21-40 for guidance on defensive measures and FM 21-41 for procedures.

6-42. Defense Against Nuclear Attack

a. Defensive measures by the battalion consist in providing training indoctrination of all personnel in nuclear weapon effects and the few simple protective measures taken by individuals when surprised by nuclear attack.

b. Where there is danger of nuclear attack, action is taken to see that—

(1) Alert plan is put into effect.

(2) Personnel working outdoors are properly clothed, avoiding unnecessary exposure of skin surfaces.

(3) Food supplies are covered with canvas and other materials; or, preferably, placed in underground storage.

(4) Vehicles and equipment are dispersed.

- (5) Volatile fuel supplies are dispersed.
- (6) Ammunition and weapons are protected against direct exposure.
- (7) Protective shelters are prepared for use, when practicable.
- (8) Plans are prepared to extinguish all fires and shut down all powerplants not required for communication facilities.

c. After the attack, the battalion is alerted for a possible airborne attack; the wounded are cared for; trapped personnel rescued; and fires fought. The avenues of approach to a danger area are marked with warning signs, and decontamination procedures are begun. The general principles of decontamination procedures are described in FM 21-40 and TM 3-220.

6-43. Evacuation

a. The evacuation of a bivouac may become necessary when the battalion, together with other units in the area, becomes exposed to a large scale enemy attack.

b. Authority to order an evacuation is limited to higher headquarters. This includes authority to order abandonment or demolition of equipment and installations.

c. Based on the evacuation order issued from higher headquarters, the operations section of the battalion prepares the operation plan for evacuation. When time is pressing, the plan and the orders to elements of the battalion may have to be issued in fragmentary form.

d. Upon receipt of the evacuation order from higher headquarters, the battalion commander takes immediate action as follows:

- (1) Orders are issued to cease work.
- (2) One of the companies is designated as the covering force, and immediately begins to organize the ground for defense establishing its outpost line, and conducting extensive reconnaissance patrolling. The company sends out details to construct road blocks and obstacles to delay the enemy advance. It establishes liaison with other friendly units that may be in or may

arrive in the area. Its mission is to defend its position and protect the rear and flanks of the command during its movement to the assembly position until the evacuation is completed. It has the additional mission of executing authorized demolitions prepared by the battalion upon its withdrawal.

(3) Headquarters and headquarters company normally is assigned the task of coordinating the evacuation of all equipment in accordance with the priority designated by the battalion operations officer.

(4) Demolition detachments, under the control of the executive officer, take action to insure compliance with higher headquarters directives as to authorized demolitions. Details from the other organic companies are assigned to this group to perform demolitions by mechanical means, such as sledge hammers and fire.

e. A checklist for an operations plan for evacuation is as follows:

- (1) Cessation of work.
- (2) Designation of organic company as the covering force.
- (3) Priority of equipment evacuation.
- (4) Assignment of responsibility for withdrawal of equipment, including that of covering force.
- (5) Assignment of tasks to prepare authorized demolitions.
- (6) Destination of assembly point and routes.
- (7) Priority of movement of companies and composition of march units.
- (8) Security measures observed by march units.
- (9) Administrative, supply, and communications details.

f. When possible, arrangements should be made to evacuate some of the battalion personnel by air. This will permit the men to stay longer, evacuate more equipment, or perform more complete demolitions.



CHAPTER 7

ENGINEER TOPOGRAPHIC COMPANY, CORPS

Section I. ORGANIZATION

7-1. Composition, TOE 5-327

a. The engineer topographic company, corps, consists of a company headquarters, a map distribution section, a survey platoon, a cartographic platoon, and a reproduction platoon.

Operations personnel and maintenance personnel for topographic equipment, vehicles, and other equipment are included in the company headquarters.

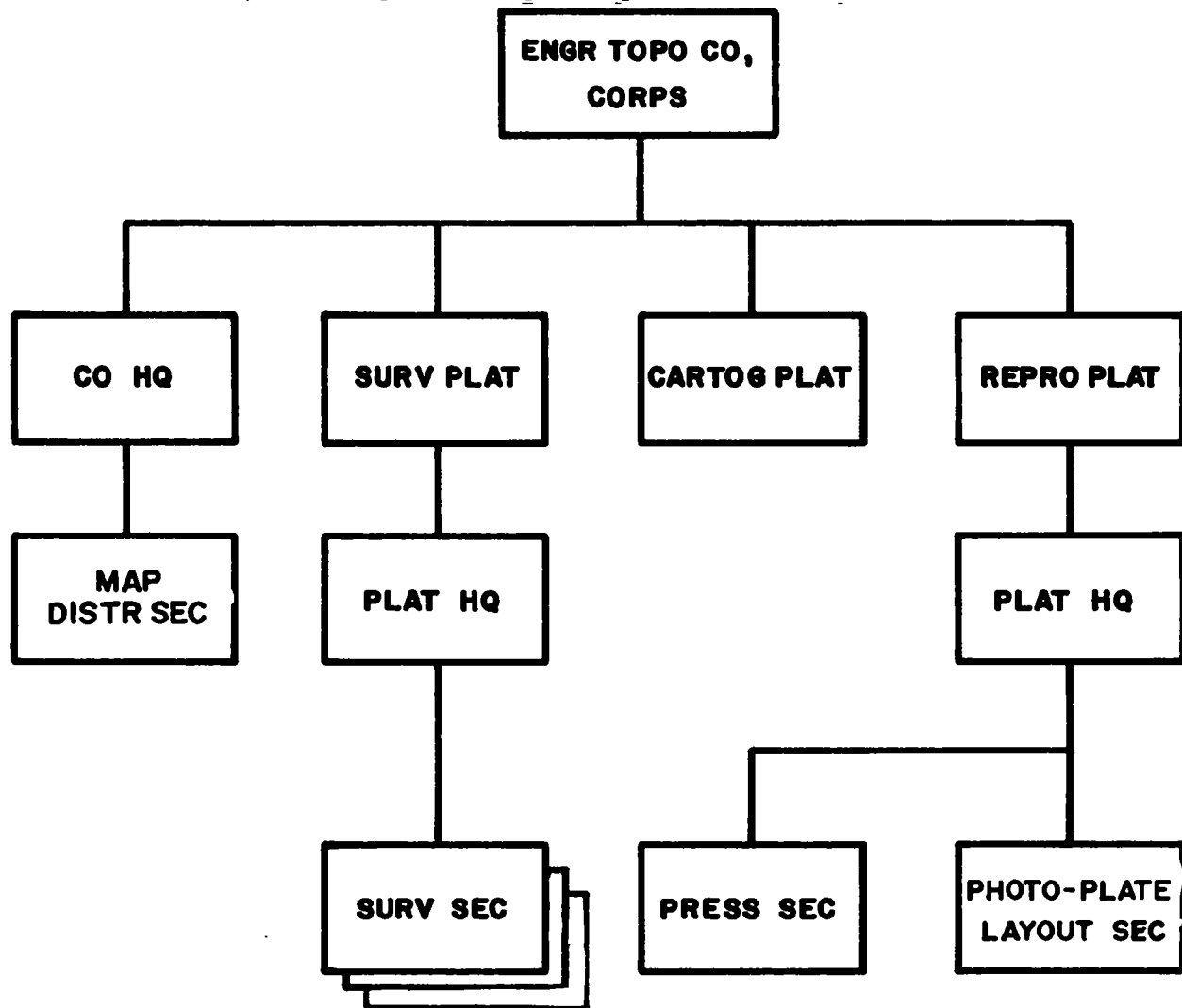


Figure 7-1. Engineer Topographic Company, Corps.

b. The company is equipped with van-type trucks that house major items of photomapping and reproduction equipment and provide a limited amount of inclosed working space. The bodies of these vans are weatherproof and insulated against extremes of temperature, and are equipped with facilities for maintaining practical working temperatures.

7-2. Relation to Corps Command

a. The engineer topographic company, corps, normally is assigned to corps or a corps-size independent task force.

b. The company will be employed as the corps commander directs, and operates under the operational control of the corps combat engineer brigade. Topographic planning for the production and distribution of maps is the staff responsibility of the corps G2. The primary function of the company is to provide map and survey information and reproduction service in support of corps operations. The company normally is bivouacked close to corps headquarters.

7-3. Relation to Other Topographic Units

a. The engineer topographic company commander advises the corps engineer brigade commander and his staff on all matters pertain-

ing to maps and charts. He assists the corps engineer in determining the mapping needs of corps units. The company commander coordinates with the corps artillery survey officer the survey requirements of the artillery in connection with fire control.

b. When not employed on its primary functions of providing survey control and of producing maps for use by the corps, the company assists base and army topographic battalions in the development of theater mapping programs.

7-4. Mission

a. The mission of the corps topographic company is to provide topographic maps, overprinted maps, topographic intelligence, and artillery and topographic survey data in support of corps or independent task force operations.

b. Individuals of the company can engage in effective coordinated defense of the unit's area or installation.

7-5. Mobility

The engineer topographic company, corps, is approximately 95 percent mobile with organic transportation. Additional transportation is normally required to move map stocks. The company is 100 percent air transportable in medium transport aircraft.

Section II. OPERATIONS, GENERAL

7-6. Company Headquarters

Company headquarters provides the necessary personnel and facilities for messing, administration, operation, supply, and organizational maintenance for vehicles and direct support maintenance for organic topographic equipment.

7-7. Operations Personnel

The operations personnel for the company are included in company headquarters. These personnel are under the supervision of the executive officer, who is also the operations officer. The operations officer assists the company commander in planning the accomplishment of assigned missions, projects, and training.

7-8. Map Distribution Section

This section operates the corps map depot which stocks maps and related topographic material for supply point distribution to corps units and DISCOM.

7-9. Administrative Operations

a. The company is equipped to function as a separate unit, and is administratively self-sustaining. In this respect, the engineer topographic company, corps, differs from the companies of the topographic battalion which require administrative support from battalion headquarters.

b. Corps signal units provide communications from the corps headquarters to the com-

pany headquarters, engineer topographic company. Company headquarters installs and operates telephone switching facilities and provides telephone and messenger service to the platoons. Company headquarters has FM voice radios for operation in the company command net. It also has an AM receiver for use in a broadcast warning net.

c. The platoon sergeants, while responsible to their platoon chiefs for the administration and discipline of their platoons, are primarily technical supervisors. During map production

operations, they have little time to devote to administrative matters. For this reason, one of the most important functions of the first sergeant is to devise ways and means to relieve the platoon sergeants of as much of the administrative load as possible. The first sergeant keeps in close contact with the platoon sergeants, informing them of current administrative and personnel matters that affect their platoons, and obtaining administrative and personnel information by personal visits rather than by means of platoon reports.

Section III. TECHNICAL OPERATIONS

7-10. General

a. Technical operations of the company include all the necessary operations to produce maps and related products for use by the corps in its area of responsibility. At level 1 (full strength), the unit provides:

(1) Topographic surveys of 2d or 3d order accuracy for mapping and other functions. Surveys to extend position azimuth and elevation control forward from corps rear area into division rear area for all users of this control within the corps area.

(2) Ground control within unit capabilities to corps artillery missile units and other artillery organizations on a priority basis.

(3) Drafting of special maps, overprints, and overlays for corps operations; laying controlled or uncontrolled mosaics from aerial photographs and making limited revision of existing maps at the rate of 10 to 20 map sheets per month; compilation and revision of military topographic and planimetric maps.

(4) Reproduction in quantity—by offset lithography—monochrome and multicolor maps, photomaps, overlays, overprints, and/or other topographic and engineer intelligence material at the approximate rate of 600,000 impressions per month.

(5) Receiving, storing, and making bulk distribution of maps, trig lists, and engineer survey control point information to corps units; collating and distributing engineer intelligence material as required.

(6) A sufficient number of ground point locations through limited extension of ground control by photogrammetric means from a strip or strips of aerial mapping photography.

(7) Direct support maintenance of authorized, topographic survey (electronic and optical) instruments and reproduction equipment.

b. This unit is a Category II unit (AR 320-5), when organized at levels 2 or 3 operational capabilities are reduced to 90 percent and 80 percent, respectively.

c. The equipment of the company is limited by the necessity for mobility which requires van-mounted reproduction and photomapping equipment.

(1) In addition to its normal housekeeping equipment, company headquarters has tool sets provided for organizational maintenance.

(2) The survey platoon has equipment for plane table work, leveling by instrument and barometric methods, and 1.0 and 0.2 second theodolites for traverse and triangulation, and distance measurement by electronic and optical means. An electric digital computer is provided for computation and adjustment of survey field data.

(3) The cartographic platoon has van-type trucks containing copy and supply equipment, photomapping section, cartographic section, multiplex section, map revision section, and rectifier section.

(4) The reproduction platoon has van-type trucks containing two offset lithographic

presses, a copy camera, paper cutter, photo-mechanical process section, and a laboratory section. All equipment is electrically operated.

(5) Complete lists of equipment will be found in the unit's current TOE. Component parts of sets are listed in appropriate supply manuals.

7-11. Survey Platoon

a. The survey platoon performs topographic surveys as required for topographic mapping and establishes ground control for missile support, surveillance devices, and conventional artillery. The platoon consists of a platoon headquarters and three survey sections. It may be augmented by an additional survey section when required.

b. Platoon headquarters consists of a warrant officer who is a survey technician as well as platoon chief, a survey supervisor, a chief topographic computer, a topographic computer, a cartographic draftsman, a powerman, and a light vehicle driver.

c. Each of the survey sections consists of a section chief, topographic surveyors, topographic computers, survey recorders, and rodmen-tapemen. These sections may be subdivided into small survey field parties—usually of three men each—for the accomplishment of specified survey missions. The survey platoon furnishes ground control to corps artillery and other organizations on a first priority basis when required. During periods when the situation is static, the platoon improves its survey data and conducts engineer and topographic surveys as required. The survey sections are authorized voice radio sets to maintain communication with platoon headquarters.

7-12. Cartographic Platoon

The cartographic platoon performs the cartographic drafting required in the preparation of expedient maps and limited revisions to existing maps, preparation and compilation of the map manuscript for color separation, prepares color separation materials for lithographic reproductions, and accomplishes multiplex control extension using specialized application of photogrammetry. The warrant officer is assisted by a platoon sergeant who maintains production control, schedules or priorities, etc. The platoon, as depicted, does not provide a platoon headquarters nor a section organization. However, to provide for scheduling and phase production, the platoon is usually organized into a platoon headquarters, a compilation section, and a drafting section at the discretion of the unit commander.

7-13. Reproduction Platoon

a. The reproduction platoon reproduces maps and photomaps in single or multicolor and overprints in one or more colors on existing maps, using photolithographic and lithographic methods.

b. The platoon consists of a platoon headquarters, a photo plate-layout section, and a press section.

7-14. Aircraft Requirements

Aircraft support is required for urgent surveys in support of artillery and missile fire control, for topographic mapping field survey operations, and for topographic survey reconnaissance operations. When required and when authorized, aircraft are provided by appropriate cellular teams of TOE 1-500.

Section IV. TACTICAL OPERATIONS

7-15. General

The engineer topographic company, corps, is responsible for its own local security and should be prepared to fight in self-defense. The company being normally located close to corps headquarters usually becomes a part of the defense plan for the corps headquarters area.

7-16. Armament

Armament of the company consists of individual weapons.

7-17. Reorganization for Combat

The corps topographic company reorganizes for combat to defend its bivouac and working area.

The company should be divided into two echelons—a combat or forward echelon and a security or rear echelon. A typical reorganization is as follows:

a. The combat echelon consists of—

(1) A company headquarters composed of the company commander, executive officer, first sergeant, operations sergeant, and communications personnel.

(2) Two rifle platoons organized from the cartographic and reproduction platoons, and a third from the survey platoon if located near the company headquarters. Each platoon is organized into rifle squads.

(3) The map distribution section, less the map distribution officer, is organized as a rifle squad. It serves as a small reserve at company headquarters, or is assigned to one of the platoons as required by the situation.

(4) Radios (AN/GRC-125, dismounted from vehicles, and AN/PRC-25) from the survey sections, as available, are distributed equally among all the platoons to give them a communications capability.

b. The rear echelon, commanded by the map distribution officer, consists of those personnel of company headquarters not needed in the forward echelon. The rear echelon is responsible for firefighting, damage control, preparation

and distribution of meals, and preparation for evacuation or destruction of equipment and materiel in the event the bivouac and working areas become untenable.

c. Corps provides telephone line from corps headquarters to the company command post. Company headquarters provides telephone line to the platoons.

d. Rations and water supplied by the rear echelon to the combat echelon; hot meals are provided when the situation permits. Ammunition supply is controlled by the supply sergeant; transportation and loading personnel are furnished by the rear echelon.

e. The reorganization plan becomes effective upon receipt of an alert, usually from corps headquarters. On alert, all topographic work ceases. Equipment not already located in the rear echelon area (designated by the company commander) is evacuated to that area. Full field equipment is retained by all personnel. All other individual equipment is stored in the rear echelon area.

f. The company should rehearse its plan for reorganization for combat at frequent intervals.

g. Paragraphs 6-40 through 6-42 discuss the defensive measures that should be employed against various types of attack.



CHAPTER 8

ENGINEER TOPOGRAPHIC AND INTELLIGENCE TEAMS

8-1. General

a. TOE 5-540-series, provides small units of highly qualified technical personnel and equipment of platoon or team size for special purpose missions or for augmentation of regular engineer topographic units.

b. These topographic and intelligence teams provide survey, photographic, photomapping, reproduction, map distribution, terrain and hydrologic intelligence, and topographic planning and control support where required. These teams are closely associated with topographic units, supplement their activities and receive support from them.

8-2. Topographic Planning and Control Team

Provides program planning and technical supervision of map compilation; surveying and geodetic activities including supervision, collection, maintenance and dissemination of survey control data; supervision and coordination of map reproduction including evaluation of reproduction facilities and planning the employment of such facilities in the map reproduction program; supervision of the topographic and map supply program, including operation of map depots and supply points throughout the command. Maintains liaison with higher headquarters and allied armies. Supervises non-United States indigenous reproduction and mapping agencies used in the program. The team is normally allocated one per theater army headquarters, field army headquarters or topographic battalion as required. This team requires support similar to that described in paragraph 8-4b.

8-3. Geodetic Survey Team

The geodetic survey team provides technically qualified personnel and equipment for high

order geodetic surveys and computations for guided missiles. Normal allocation is one team per field army, attached to the engineer army topographic battalion for administrative support.

8-4. Survey Team

a. This team performs second-order astrometric position and azimuth observations; topographic surveys by means of plane table and theodolite, to include triangulation by quadrilaterals; triangulation reconnaissance, and electronic distance measuring.

b. The survey team provides technically qualified personnel and equipment for the survey operations of one party. The team is capable of performing any military survey function and is usually employed on a short term basis to augment the topographic survey potential of larger units when their survey mission is not large enough to warrant the assignment of additional survey platoons or companies. This team is designed for assignment to an engineer brigade, to a task force or to corps, army, or theater topographic units requiring a one-team augmentation to TOE engineer artillery survey capability. Transportation of the team is sufficient for its operations and movement. It requires full support from the units to which assigned or attached for supply, communications, maintenance, food service, administration, and medical service.

8-5. Survey (Airborne) Team

Provides jump-qualified personnel and equipment for topographic and artillery fire control support surveys, for an airborne corps or independent airborne force to include support of the engineer combat battalion (airborne). Normally assigned to a topographic unit for support similar to that described in paragraph 8-4b.

8-6. Photographic Evaluation Team

The photographic evaluation team provides technically qualified personnel and equipment for evaluating aerial photography for mapping and charting purposes. The team normally is attached to a local unit for administrative support (para 5-13).

8-7. Photomapping Platoon

The photomapping platoon provides technically qualified personnel and equipment for the preparation of topographic maps by multiplex methods from aerial photographs. The platoon normally is attached to the engineer base or army topographic battalion when mapping operations require additional effort less than a base photomapping company. The platoon requires support similar to that described in paragraph 8-4b.

8-8. Map Reproduction Platoon

The map reproduction platoon provides technically qualified personnel and equipment for the preparation and printing of maps and other types of reproduction work. The platoon is similar to the map reproduction platoon of the engineer base reproduction company. The platoon is attached to the engineer base map reproduction company when mapping operations require additional effort less than a base map reproduction company. The platoon requires support similar to that described in paragraph 8-4b.

8-9. Map Distribution Platoon

The map depot platoon provides technically qualified personnel and equipment for the receipt, storage, issue, and distribution of maps of a base, army, or corps headquarters. The platoon is similar to the storage platoon of the engineer base map depot company. Platoons may operate as a depot. Usually three platoons are attached to each army topographic battalion for forward depots. The platoon requires support similar to that described in paragraph 8-4b.

8-10. Military Hydrology Team

Provides personnel and equipment for preparation of hydrologic and hydraulic analysis and studies in connection with military operations. The team is normally allocated one per field army or independent corps; may be assigned to a geographic area, determined by stream and drainage basin characteristics. This team requires support similar to that described in paragraph 8-4b.

8-11. Terrain Team

The terrain team provides technically qualified personnel and equipment for the overt collection, evaluation, and dissemination of terrain data; the production of terrain studies, and provision of consultant services in military geology and military hydrology. Normal allocation is one team per army but may be assigned at a lower level. The team requires support similar to that described in paragraph 8-4b.

CHAPTER 9

COORDINATING TOPOGRAPHIC SERVICES

9-1. General

Liaison between the responsible mapping staff and the major tactical elements of the command should be close and continuous. Liaison between the engineer staff and other U.S. services is on the basis of joint responsibility for a common undertaking; liaison between the engineer staff and the using arms is on the basis of the supplier and the consumer.

9-2. Coordination with the U.S. Air Force

The Air Force is generally responsible for conducting aerial mapping photography. In a theater of operations, the production of aerial photography is coordinated by G2 air. Liaison with photographic aviation is established by the assignment of an engineer photoevaluation team to the photographic organization charged with the general photographic task. This evaluation team insures that aerial photography meets the established specifications as closely as operational conditions permit. The evaluation team has the authority to accept or reject aerial cartographic photography.

9-3. Coordination with Other Arms and Services

a. Liaison between engineer staffs and the artillery is maintained on both the planning and operation level to insure a mutual understanding of the joint mapping and ground

control problem and to obtain a suitable working agreement for its solution.

b. Other arms and services, particularly when preparing for special operations such as amphibious or airborne operations, have special mapping problems that call for liaison and close coordination once requirements are validated by G2. Liaison between the mapmaker and the consumer is always an essential function of the engineer staff.

c. Liaison with the Navy and Air Force when joint operations are involved is also essential to insure that adequate contact and exchanges of map and chart data are maintained and that photographic and cartographic missions are coordinated.

9-4. Liaison with Adjacent Units

Liaison between adjacent units at all levels is as important in mapping as it is in tactical operations. Army and corps engineer staffs require mapping contacts in all directions. Their commands do not operate in isolated compartments; sector boundaries change and tactical units are transferred as the tactical situation changes. Lateral liaison is as important as liaison in depth to permit lateral extension of control, reinforcement of production capacity for peak loads, and the exchange of information obtained from captured maps, documents, or prisoners.



CHAPTER 10

TRAINING

Section I. GENERAL

10-1. Training Objectives

a. The training of an engineer topographic unit has, as its ultimate objective, the development of individual and team skills to a degree necessary to enable the unit to accomplish its primary mission of providing maps and engineer survey information and to function as a part of the army team.

b. Basic combat and advanced individual training, and basic and advanced unit training are conducted in the unit as prescribed by appropriate army training programs (ATP).

10-2. Training Doctrine

Training doctrines and principles governing all units of the army are contained in FM 21-5 and FM 21-6.

10-3. Training Phases

Training of engineer topographic units advances by phases. Training prescribed by army training programs is phased progressively as cadre training, basic combat training, advanced individual training, basic unit training, advanced unit training. This is followed by post-cycle training which includes modified pre-

scribed training, retraining, training individuals in related or higher MOS, specialized unit training, and field exercises as required.

10-4. Combined Training

The integration of topographic teams, platoons, companies, and battalions into unified army teams is accomplished during basic and advanced unit training. Whenever possible field army topographic units should participate in field exercises and maneuvers which apply technical and logistical procedures and doctrine to simulated combat situations. Training between artillery survey personnel and topographic engineers, particularly those of corps companies, should be conducted whenever possible.

10-5. Schools

Unit schools are established to bridge the gap between instruction offered at the formal schools and instruction obtained from on-the-job training. They are established for specialist training of personnel who have not been school trained or who need refresher courses. These schools are conducted during the second period of advanced individual training.

Section II. ARMY TRAINING PROGRAM

10-6. General

a. The training program for a newly activated engineer topographic unit is prescribed in appropriate ATP. The ATP covers all phases of training from the time the cadre assembles and the untrained individuals enter the organization to the readiness of the company for company operations.

b. The training of engineer topographic units is similar for cadre, basic combat, and for portions of advanced individual and basic unit training which are common to all personnel of the units. Training differs for advanced unit training for certain portions of the advanced individual training phase which relate to MOS, officer, and NCO training; and for certain por-

tions of the basic unit training phase which relate to section, platoon, and company training.

10-7. Cadre Training

At the discretion of the unit commander, NCO's not required in conducting the training of the unit and/or selected personnel in need of training above the level of the training conducted for the unit may be provided advanced level instruction by substituting the training shown in ATP 21-160 (Cadre Training), or portions thereof, for training during the unit training phase. This training period is used to test the proficiency of the cadre and make corrections; review the employment duties and TOE of the engineer topographic unit; refresh the cadre in basic military and engineer subjects; review training methods, check post facilities for training aids and areas; and to conduct organizational and administrative duties.

10-8. Basic Combat Training

a. Basic combat training covers the first eight weeks of training. During this training phase the recruit receives indoctrination training and instruction in basic combat skills and individual weapons which transform the untrained individual into a basic soldier.

b. An outline of subjects and hours to be devoted to this phase of training is given in sections I and II of appropriate ATP's.

10-9. Advanced Individual Training

a. The advanced individual training phase covers 10 weeks for corps and army topographic units and 8-10 weeks for base topographic units. The first period consists of common training and the second period of specialized training. Units may receive partially trained fillers which may permit omission of basic combat training and shortening of advanced individual training phase. The phase also includes schools for officers and noncommissioned officers.

b. During the first period of advanced individual training, the basic soldier skills of the engineer soldier are developed. The indoctrination process is continued during this period of training.

c. During the second period of advanced individual training, the engineer soldier takes the unit functional (MOS) training which is devoted to the development of the basic engineer soldier into a specialist. The training is still on an individual basis and is designed to fit the soldier into a definite place in his unit.

d. Officer and NCO training is carried on during this phase of individual training to develop ability and knowledge in job management, administration, supply, maintenance, and leadership.

10-10. Basic Unit Training

a. Basic unit training covers a period of 7 weeks for corps, army, and base topographic units, and is designed to provide team training whereby individual engineer soldiers are welded into effective sections and platoons.

b. All units receive common training in drill, inspections, tactical combat principles, engineer topographic unit orientation, and administrative and tactical movements.

c. Battalion headquarters sections and company headquarters perform on-the-job training.

d. The survey, photomapping, reproduction, and map distribution or depot platoons perform the actual operation functions for which they are designed.

e. Common training and unit operations are continuous, integrating the sections and platoons into efficient units; the headquarters elements and these units coordinate functional responsibilities into a producing topographic organization.

f. Battalion and component company headquarters supervise and coordinate the work of the units during this training phase with the objective of achieving overall operating efficiency.

g. Training during this phase is conducted under conditions requiring night and dual shift operations. Tactical problems, including security in bivouac, equipment, and supplies are introduced.

h. The last week of basic unit training for all units is devoted to unit training tests.

10-11. Training Tests

a. Each engineer soldier and engineer topo-

graphic unit for which a training test exists, in addition to being tested during the training test cycle, will be tested again at such times as may be prescribed, including at the completion of the initial training cycle. As a minimum requirement, each unit will be tested at least once a year.

b. The training test for the engineer topographic battalion, army, usually consists of a move with all men and equipment at least 20 miles and the accomplishment of appropriate work projects on a two-shift basis under simulated tactical conditions, 16 to 20 hours per day. The test usually includes necessary advance reconnaissance; motor movement of personnel and equipment to a tactical bivouac; provision for local security; occupation, organization, and evacuation of bivouac; a work project requiring 40 to 60 hours to complete, with available equipment and may include such tasks

as astronomic determination of a position, a third order 6-mile closed traverse, a plane table sketch of the bivouac area, a semicontrolled mosaic, a black and white planimetric revision overlay, black and white line maps on transparent material from photomaps, the reproduction of a semicontrolled mosaic as a photomap, the reproduction of several 7½-minute quadrangles, the establishment of a map distribution center, with related planning, supervision, administration, communication, liaison, and supply.

c. The training test for the engineer topographic company, corps, is similar to that of the engineer topographic battalion, except on a smaller scale. Base survey, photomapping, reproduction, and depot companies of the engineer base topographic battalion usually are tested individually by companies under similar simulated conditions.

Section III. POSTCYCLE TRAINING

10-12. General

a. Postcycle training continues the initial army training program cycle of the engineer soldier and his unit in order to maintain and perfect that training. It is the period during which deficiencies are corrected in individuals and units, and in which qualified individuals and units are given specialized training in related fields.

b. No specific number of weeks is prescribed for the postcycle training period. In determining the exact length of the postcycle training period for engineer topographic unit, consideration should be given to the probable date the unit will be sent on operational missions.

10-13. Retraining

a. Individuals found deficient in their primary MOS as a result of observation or tests are retrained until a proper standard is attained or are assigned a new primary MOS appropriate to their abilities and qualifications.

b. Engineer topographic units found deficient as a result of tests in any phase of training are retrained until a proper standard is attained.

c. Units which have undergone a large turnover of personnel may have to retrain completely under the prescribed ATP.

d. Major engineer commanders may exercise their own judgment in requiring engineer units to retrain completely under the prescribed ATP, or to undergo modified training.

10-14. Filler Replacements

All filler replacements received by the engineer topographic units after the completion of unit training, which have not undergone advanced individual training, should be qualified in general engineering subjects. The unit commander is responsible for the training of these filler replacements. Where a replacement has had civilian experience in a related field, he may require only a short period of orientation. Practical tests should be given to replacements who claim prior civilian experience in a specialist job before they are assigned, to determine the extent of their knowledge and skill. Replacements should be grouped in special classes, or, where the number is small, receive special

individual instruction. This training should be in addition to their MOS on-the-job training.

10-15. Substandard Personnel

A portion of the personnel in topographic units will not be able to advance beyond basic skills. When this is due to lack of intelligence or adaptability, special training should be given these men. Care should be taken to place such individuals in positions in the unit suitable to their capabilities. Some men will require intensive training, conducted at a slow pace, in special classes. Instructors chosen to train these men should be selected for their patience and ability to present facts in a clear and simple manner. Substandard personnel are often dependable and efficient workers if properly trained and assigned to jobs within their capabilities.

10-16. Instructor Training

a. The engineer topographic unit commander should evaluate the instructional ability of his personnel and continually emphasize and conduct instructor training.

b. Battle losses, sickness, levies, and other causes will deplete engineer units. The training of filler replacements becomes a continuous process. The unit should become and remain adept at training replacements to take their places in the organization.

c. Instructor training begins at the unit headquarters level. Special classes are conducted by unit officers for junior officers and by key NCO for supervisory personnel. They in turn conduct classes for new or substandard personnel of the unit. Instructors must be knowledgeable in the subject matter and proficient in the art of teaching.

APPENDIX A

REFERENCES

A-1. Department of the Army Pamphlets

- DA Pam 310-series Military Publications.
 DA Pam 750-1 Preventive Maintenance Guide for Commanders.

A-2. Army Regulations

- AR 10-5 Organization and Functions of the Department of the Army.
 AR 117-5 Military Mapping and Geodesy.
 AR 310-1 General Policies.
 AR 320-5 Dictionary of United States Army Terms.
 AR 320-50 Authorized Abbreviations and Brevity Codes.
 AR 350-1 Army Training.
 AR 380-5 Safeguarding Defense Information.
 AR 725-50 Requisitioning, Receipt, and Issue System.
 AR 750-1 Maintenance Concepts.
 AR 750-8 Command Maintenance Management Inspections.

A-3. Field Manuals.

- FM 3-8 Chemical Reference Handbook.
 FM 3-10 Employment of Chemical and Biological Agents.
 FM 3-12 Operational Aspects of Radiological Defense.
 FM 5-1 Engineer Troop Organizations and Operations.
 FM 5-20 Camouflage.
 FM 5-30 Engineer Intelligence.
 FM 5-33 Engineer Cellular Teams.
 FM 5-36 Route Reconnaissance and Classification.
 FM 5-135 Engineer Battalion Armored, Infantry and Infantry (Mechanized) Divisions.
 FM 5-136 Engineer Battalions, Airborne and Airmobile Divisions.
 FM 5-142 Nondivisional Engineer Combat Units.
 FM 5-144 Engineer Amphibious Units.
 FM 5-162 Engineer Construction and Construction-Support Units.
 FM 6-2 Artillery Survey.
 FM 6-20-1 Field Artillery Tactics.
 FM 6-20-2 Field Artillery Techniques.
 FM(C) 6-37 Field Artillery Missile Battalion SERGEANT (U).
 FM(S) 6-39 Field Artillery Battalion (PERSHING) (U).
 FM(C) 6-40-2 Field Artillery Missile Gunnery (U).
 FM 6-120 The Field Artillery Target Acquisition Battalion and Batteries.
 FM 6-121 Field Artillery Target Acquisition.
 FM 7-11 Rifle Company, Infantry, Airborne Infantry and Mechanized Infantry.
 FM 7-15 Rifle Platoon and Squads Infantry, Airborne, and Mechanized.

FM 7-20	Infantry, Airborne Infantry, and Mechanized Infantry Battalions.
FM 7-30	Infantry, Airborne, and Mechanized Division Brigades.
FM 20-32	Landmine Warfare.
FM 21-5	Military Training Management.
FM 21-6	Techniques of Military Instruction.
FM 21-26	Map Reading.
FM 21-30	Military Symbols.
FM 21-31	Topographic Symbols.
FM 21-40	Chemical, Biological, and Nuclear Defense.
FM 21-41	Soldier's Handbook for Defense Against Chemical and Biological Operations and Nuclear Warfare.
FM 21-48	Chemical, Biological, and Radiological (CBR), and Nuclear Defense Training Exercises.
FM 23-65	Browning Machinegun Caliber .50 HB, M2.
FM 29-22	Maintenance Battalion and Company Operations (nondivisional).
FM 30-10	Terrain Intelligence.
FM 31-23	Stability Operations, U.S. Army Doctrine.
FM 31-25	Desert Operations.
FM 31-30	Jungle Training and Operations.
FM 31-70	Basic Cold Weather Manual.
FM 31-71	Northern Operations.
FM 31-73	Advisors Handbook for Stability Operations.
FM 41-10	Civil Affairs Operations.
FM 55-35	Motor Transport Operations and Motor Transport Units.
FM 100-5	Field Service Regulations, Operations.
FM 100-10	Field Service Regulations, Administration.
FM(C)100-20	Field Service Regulations—Internal Defense and Development (ID & ID) (U).
FM 101-5	Staff Officers' Field Manual; Staff Organization and Procedure.
FM 101-10-1	Staff Officers' Field Manual; Organizational, Technical, and Logistical Data —Unclassified Data.

A-4. Technical Manuals

TM 3-210	Fallout Prediction.
TM 3-220	Chemical, Biological and Radiological (CBR) Decontamination.
TM 5-230	General Drafting.
TM 5-231	Mapping Functions of the Corps of Engineers.
TM 5-232	Elements of Surveying.
TM 5-233	Construction Surveying.
TM 5-235	Special Surveys.
TM 5-236	Surveying Tables and Graphs.
TM 5-240	Map Compilation, Color Separation, and Revision.
TM 5-241-1	Grids and Grid References.
TM 5-241-8	Universal Transverse Mercator Grid.
TM 5-243	Cartographic Aerial Photography.
TM 5-244	Multiplex Mapping.
TM 5-245	Map Reproduction.
TM 5-248	Foreign Maps.
TM 5-441	Topographic Surveying.

TM 5-6001 to	Reproduction Equipment; Technical Manuals Issued with TOE Equipment.
TM 5-6045	
TM 21-305	Manual for the Wheeled Vehicle Driver.
TM 30-245	Image Interpretation Handbook.
TM 30-246	Tactical Interpretation of Air Photos.
TM 30-252	Photographic Interpretation Manual: Photographic Metrics.

A-5. Army Training Programs

ATP 5-305	Engineer Topographic Units.
ATP 21-114	Male Military Personnel Without Prior Service.
ATP 21-160	Cadre Training.

A-6. Tables of Organization and Equipment

TOE 1-500	Aviation Operating Teams.
TOE 5-305	Engineer Topographic Battalion, Army.
TOE 5-306	Headquarters and Headquarters Company, Engineer Topographic Battalion, Army.
TOE 5-307	Engineer Map Reproduction and Distribution Company, Army.
TOE 5-308	Engineer Photomapping Company, Army.
TOE 5-327	Engineer Topographic Company, Corps.
TOE 5-344	Engineer Base Map Depot Company.
TOE 5-346	Headquarters and Headquarters Detachment, Engineer Base Topographic Battalion.
TOE 5-347	Engineer Base Reproduction Company.
TOE 5-348	Engineer Base Survey Company.
TOE 5-349	Engineer Base Photomapping Company.
TOE 5-540	Engineer Topographic and Intelligence Teams.
TOE 29-500	Composite Service Organization.



APPENDIX B

TYPICAL SOP FOR AN ENGINEER TOPOGRAPHIC BATTALION

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Classification

Headquarters
Location
Date

STANDARD OPERATING PROCEDURE

1. GENERAL

- a. Purpose. (Statement of general coverage and use of SOP, including applicability, special contingencies, and references.)
- b. References. SOP and training memoranda of Engineer Section, and Engineer Topographic ; AR, SR, FM, and TM.
- c. Effective. Effective upon publication.

2. ADMINISTRATION AND TECHNICAL OPERATIONS

- a. Command and Control.
 - (1) Command posts. Companies will report change of command post location immediately.
 - (2) Liaison.
 - (a) Battalion headquarters will maintain liaison with detached elements.
 - (b) Companies and platoons will maintain liaison with supported units.
 - (3) Signal communications.
 - (a) General. Current SOI will govern.
 - (b) Messengers. Each company will furnish one messenger to battalion CP upon moving to new bivouac areas; messenger to be relieved as soon as telephone communications are established.
 - (c) Wire installations. On order this headquarters, H&H company will furnish detail of three men to assist in laying telephone wire to each company.
 - (d) Signal security. Code converters and simple special codes will be used for security of messages within battalion; messages will be authenticated.
- b. Administration.
 - (1) Unit journal. Detailed reports of activity for battalion journal will be furnished adjutant daily by all companies and staff sections for 24-hour period ending preceding midnight.
 - (2) Replacements. Thorough orientation of replacements, especially mission and history of battalion.
 - (3) Unit funds. Unit funds will be closed out last day of each month; submitted to executive officer for audit by fifth day of succeeding month.
 - (4) Leave. Officers and men of battalion will receive same amount of leave time at rest centers.

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(5) Evacuation.

(a) Patients will be evacuated to nearest medical installation.

(b) Battalion collection point will be located near battalion CP.

(6) Daily strength returns. Companies will submit daily strength returns as of 2400 to message center by 0900 to be turned over to adjutant, who will submit consolidated daily strength return to engineer section headquarters by 1100.

(7) Mail.

(a) Outgoing mail will be delivered by companies to battalion mail clerk.

(b) Battalion mail clerk will deliver incoming mail to companies by most expeditious means.

(8) Quarters party.

(a) Quarters detail will consist of two men per company. Assigned personnel will report to adjutant before movement of battalion.

(b) Each company detail will carry company signs, tracing tape, flashlights, wire cutters, and one mine detector.

(c) H&H Company will furnish one truck.

(9) Wearing of the uniform. (Annex 1)

(10) Schedule of calls. (Annex 2)

c. Intelligence.

(1) Prisoners of war.

(a) Capturing units will disarm, search, tag and evacuate by most expeditious means to nearest prisoner of war collecting point.

(b) Enemy officers, NCO, privates and deserters will be separated immediately after capture.

(c) PW will not be permitted to eat, smoke, drink or rest prior to arrival at PW collecting point, except when such treatment would be inhumane.

(d) Report immediately to G2 capture of enemy aircrews and guided missile, chemical, biological, and nuclear weapons personnel and signal intelligence personnel.

(2) Captured documents. Crypto material and documents containing information on nuclear, chemical, and biological weapons delivered to G2 immediately. Other documents through S2 except as below. All documents marked with date, time and place found or captured, including name and rank of PW. Documents found on PW will be carried by prisoner's escort to collecting point. Technical documents found with captured equipment will be kept with equipment.

(3) Technical intelligence.

(a) Report of new or unusual enemy equipment, armament, nuclear material, or CB agents forwarded immediately to G2 with brief description. Captured or crashed enemy aircraft reported immediately to G2 and guarded by discovering unit.

(b) Captured enemy material will be promptly reported by capturing unit, inspected by the appropriate intelligence team, and evacuated. (AR 735-26 and FM 30-16)

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(4) Weather. G2 obtains and disseminates weather reports.

(a) Normal weather reports will be accomplished twice daily or as deemed necessary for operations.

(b) Special reports:

1. Forecasts for radiological defense twice daily or are broadcast as spot transmissions during intervals between forecasts.

2. Severe weather warnings accompany two hour forecasts or are broadcast as spot transmission at intervals between forecasts.

(5) Reconnaissance.

(a) General. Use flash message report for approach of enemy armor, aircraft, naval or amphibious landing craft, airborne troops, or enemy nuclear or CB attack. Include number, type, location, direction of movement, speed, altitude (if applicable), time observed, and identification of observer.

(b) Engineer.

1. Companies and detachments will perform general engineer reconnaissance in their operating areas without orders. Such reconnaissance is a continuing function.

2. Mapping reconnaissance will be made as directed by battalion operations section.

(c) Ground. SHELREP, and BOMREP to nearest artillery headquarters immediately.

(6) Counterinfiltration. Civilians infiltrating through unit area to or from enemy occupied territory will be apprehended and turned over to counterintelligence.

(7) Counterintelligence.

(a) Units check evacuated installations, bivouac and assembly areas to insure no classified or identifying material is left.

(b) Pass system established in conformity with unit security plan. Control measures and guard system inspected and tested frequently.

(c) CP and directional signs use assigned code titles.

(d) Known or suspected loss or compromise of codes or other classified material will be reported immediately to S2.

(e) Communications security: Compliance with current SOI and SSI.

(f) Suspected enemy agents will be immediately reported to G2.

d. Operations.

(1) Reports.

(a) Companies will submit daily status of project report as of 2400 to message center by 0900, to be turned over to battalion operations officer, who will submit consolidated battalion daily status report to engineer section headquarters by 1100.

(b) Equipment, production, materials, and completion reports will be submitted as directed by battalion operations officer.

(2) Security.

(a) Warning system. As prescribed by engineer section, headquarters SOP.

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(b) Bivouac.

1. Companies in bivouac away from battalion will furnish bivouac security of interior guard. Outpost and patrols will be set up when situation demands.

2. When battalion is in bivouac, one company will be designated to furnish all bivouac security against attack by air, armored, foot troops, and CBR agents. Security company will enforce camouflage discipline. In the absence of orders to the contrary, individual weapon operators will engage attacking aircraft, engagement of all other hostile aircraft will be on orders issued through the unit chain of command.

Nothing in this rule is to be taken as requiring actions prejudicial to the accomplishment of the primary mission. Units should employ a massed fire technique when using small arms weapons in air defense. One officer in company and one NCO in each platoon will be constantly on duty to alert company in accordance with predetermined alert plan. Vehicles will be headed toward exit, concealed, and spaced at least 50 yards apart.

(c) Motor march.

1. Truck covers will be rolled during daylight on personnel carriers to provide all-around visibility. Air guards are placed on all vehicles to warn of the approach of enemy aircraft. In addition to the security afforded by air guards, defense against air attack is achieved by continuous manning of weapons, dispersion, and maintenance of proper distances.

2. During air attack by day, vehicles will continue movement. At night, when illuminated by flares, all movement will cease.

3. At halts all troops will dismount. Each motor march unit will post sentinels to the front, rear, and flanks.

4. Survey meters will be turned on during convoy movement upon the initiation of nuclear operations.

(d) Working areas.

1. Close-in security habitually will be furnished by elements of battalion at working areas. Distant security will be arranged for by battalion operations officer with local defense troops and engineer section headquarters.

2. Officer or NCO in charge of each working area will be responsible for posting air guards, maintaining camouflage discipline, and for proper alert measures.

(3) Movement.

(a) Motor movement.

1. Movement orders will prescribe time of departure order of march, initial point, route, objective, type of movement, halt areas, or time of halts.

2. For detailed loading plan and special information dependent on local theater situation see Annex 3.

3. Rate of march on good roads, 25 mph; night 10 mph; reduce as necessary and by order. Maximum speed, 35 mph; night 15 mph; regulate to insure rate of march for column.

4. Distances to be maintained—daylight, open column, minimum

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distance 100 yards, maximum distance 200 yards; night, closed column, minimum distance consistent with safety, maximum distance 50 yards.

5. Preparatory to movement, companies will form off roads in concealment in sufficient time to pass from bivouac area to route of march without interruption or loss of distance.

6. Senior officer or NCO in vehicles carrying personnel is vehicle commander; he rides alongside driver; additional NCO rides rear of truck.

7. See paragraph 2d(2)(c) for security during motor movements.

8. See paragraph 2b(8) for quartering party.

9. Strip maps for drivers.

(b) Air movement. See Annex 4 for air movement SOP, including loading, unloading, type loads, and marshaling procedures.

(c) Rail movement. See Annex 5 for rail movement, SOP.

(d) Water movement. See Annex 6 for water movement, SOP.

(4) Training subject sequence. See Annex 9.

(5) Mapping operations.

(a) For reports required see paragraph 2d.

(b) Directives from this and engineer section headquarters will be strictly enforced. Battalion executive officer will insure compliance for their enforcement.

(c) Battalion operations section will be responsible for compliance with plans and specifications. No modifications or changes in plans and specifications will be undertaken by companies unless approved by battalion operations officer, who in turn will obtain engineer section headquarters approval.

(d) Allocation of specialized topographic and reproduction equipment will be made by battalion operations officer to companies. Companies will submit request to battalion operations officer for additional equipment needed. Battalion maintenance officer will keep battalion operations officer informed of improper use of equipment.

(e) Two-shift operations will be normal for the battalion with the exception of survey units. Survey units will work as required, depending on field conditions.

(f) Battalion operations officer will be responsible for strict observance of blackout regulations. Companies will be responsible that their blackout equipment is in working order so as not to hinder operations.

(g) Technical inspections by staff personnel will determine quality and completeness of work and proper use of equipment. During technical inspections, staff personnel will check to see whether companies and detachments are maintaining maximum output; whether supplies, especially critical items, are on hand to prevent work stoppage; whether proper methods are being used; and if job specifications are being followed.

(h) Command inspections will be made by battalion, company, and platoon commanders, or their designated representatives, to check the efficiency of personnel; to insure that subordinate commanders are complying with prescribed directives; to determine if equipment is efficiently assigned; and to correct unsatisfactory conditions and eliminate bottlenecks.

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(6) Reorganization for combat. For detailed reorganization for combat see Annex 10. (Battalion reorganization for combat is described in Appendix C)

3. COORDINATION OF LOGISTICS SUPPORT.

a. Class I. (Subsistence)

- (1) Companies will pick up rations from battalion supply point.
- (2) One reserve ration per individual will be carried at all times.
- (3) Daily strength returns for determining ration issue will be obtained from the adjutant (para 2b(6)).

b. Class II. (Clothing, individual equipment, tentage, organizational tool sets and kits, hand tools, administrative, housekeeping supplies, and equipment.)

- (1) Individual clothing records will be available at the battalion supply point.

- (2) Companies will submit requisitions to battalion supply.

c. Class III. (Petroleum fuels, lubricants, hydraulic and insulating oils, temporary protective liquid, coolants, deicing and antifreeze compounds.)

- (1) Companies will establish refueling and servicing schedules for gasoline, oil, and grease for engineer equipment and vehicles in work areas.

- (2) Companies will draw Class III supplies from battalion POL supply point.

d. Class IV. (Construction materials to include installed equipment, and all fortification barrier materials.)

- (1) Companies will submit requirements to battalion supply.

- (2) Battalion requirements will be consolidated by the S4.

e. Class V. Ammunition, explosives, mines, fuses, detonators and other associated items.

- (1) Companies will submit ammunition expenditure report as of 2400 hours to battalion supply officer by 0900 hours daily.

- (2) Battalion supply section will distribute ammunition directly to companies.

f. Class VI. (Personal demand items) available when the combat situation permits and when authorized.

g. Class VII. (Major end items, a final combination of end products which is ready for its intended use, e.g., survey, drafting equipment, mapping, reproduction sets.)

- (1) Companies will submit requisitions to battalion S4.

- (2) Battalion S4 will consolidate requisitions.

h. Class VIII. (Medical material, including medical peculiar repair parts.)

i. Class IX. (Repair Parts and Components.)

j. Class 'X'. Material for non-military programs (e.g., Agriculture and Economic.)

4. MOTOR POOL OPERATIONS (Annex 7).

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5. EQUIPMENT MAINTENANCE (Annex 8).

By command of LTC A.

OFFICIAL:

CPT Engr Topo Bn

Adjutant.

/s/B

/t/B

CPT Engr Topo Bn

Adjutant

ANNEXES.

1. Wearing of the uniform (omitted)
2. Schedule of calls (omitted)
3. Motor movement loading plan (omitted)
4. Air movement (omitted)
5. Rail movement (omitted)
6. Water movement (omitted)
7. Motor pool operations (omitted)
8. Equipment maintenance (omitted)
9. Training subject sequence (omitted)
10. Reorganization for combat (Appendix C, this manual)

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APPENDIX C

ANNEX 10 (REORGANIZATION FOR COMBAT) to SOP _____

Engineer Topographic Battalion

1. PURPOSE

The purpose of reorganizing the battalion for combat is to prepare the battalion for effective and coordinated defense of its bivouac and working areas.

2. REFERENCES

SOP and training memoranda of this battalion and training memoranda of Engineer Section _____ Army; FM 7-11, 7-15 and 7-20.

3. ALERT

The battalion reorganizes for combat upon receipt of an alert from _____ Army or when attack is imminent.

4. COMPANY PLANS

Companies will include in their SOP plans for reorganization for combat based on this annex. Specific duties for all personnel in the company will be established.

5. ORGANIZATION

The battalion will be reorganized into two echelons: a combat or forward echelon and a rear echelon.

a. The forward echelon will consist of a battalion headquarters and three rifle companies.

b. The rear echelon will consist of those administrative and maintenance personnel not required in the forward echelon.

6. BATTALION COMBAT HEADQUARTERS

Battalion headquarters will consist of a command section, an administrative section, a communications section, an operations-intelligence section, and an ammunition section.

7. HEADQUARTERS COMPANY COMBAT ECHELON

Headquarters Company, less those personnel required for battalion headquarters and the rear echelon, will be organized as a rifle company consisting of a company headquarters and two rifle platoons. Each platoon will consist of a platoon headquarters (platoon leader, platoon sergeant, and radio operator) and 3 rifle squads of 10 men each.

8. ENGINEER PHOTOMAPPING AND MAP REPRODUCTION AND DISTRIBUTION COMPANIES COMBAT ECHELONS

These companies less their rear echelon personnel will be organized as rifle companies similar to headquarters company.

9. REAR ECHELON

a. The battalion map distribution officer will command the rear echelon.

b. The rear echelon will be responsible for firefighting, damage control, preparation and distribution of rations, supply, and preparation of equipment for destruction or evacuation in the event that the work and bivouac areas become untenable.

10. COMMUNICATIONS

a. Headquarters company will furnish each of the other companies one AN/VRC-46 mounted in a 3/4 ton truck and six AN/PRC-25.

b. Headquarters company will allocate to the rear echelon one AN/VRC-46 mounted in a 3/4 ton truck.

c. Communications section, battalion headquarters, will provide telephone service from battalion to company command posts.

d. Communication between companies and platoons will be by radio and messenger.

11. ENGINEER WORK AND EQUIPMENT

a. On alert, all topographic work will cease.

b. Topographic equipment will be evacuated to a location designated by the rear echelon commander.

c. Individuals will retain full field equipment. All other individual equipment will be stored in an area designated by the battalion supply officer.

12. SUPPLY

a. Rations and water will be supplied to the combat echelon by the rear echelon. When the situation permits, hot meals will be furnished.

b. Ammunition supply will be controlled by the ammunition section of battalion headquarters. Transportation and loading personnel for ammunition will be furnished by the rear echelon; ammunition will be moved directly from rear ammunition dumps to company supply points.

c. Other supplies needed by the combat echelon will be sent forward by the battalion supply officer from the rear echelon area.

13. TRAINING

Reorganization for combat under this plan will be rehearsed during all combat training exercises.

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By Order of the Secretary of the Army:

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